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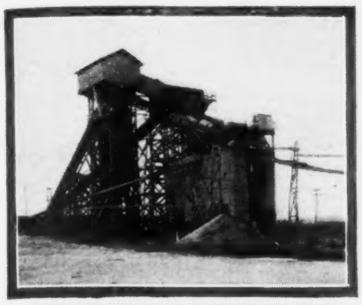
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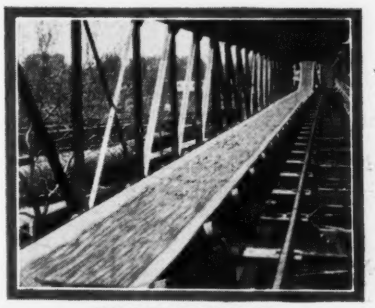
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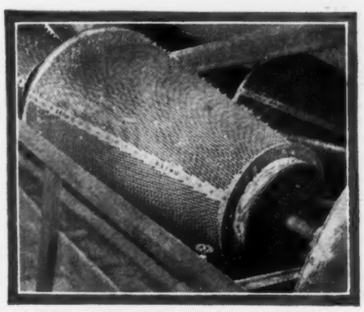
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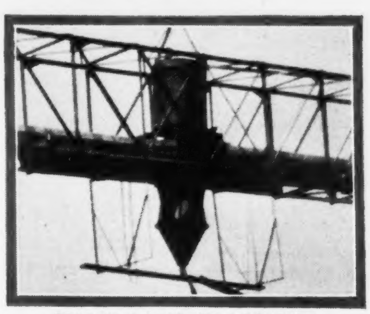
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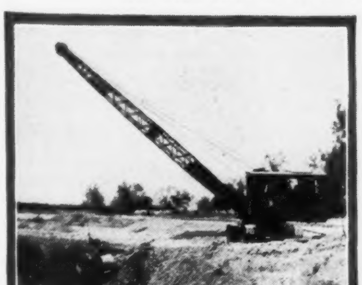
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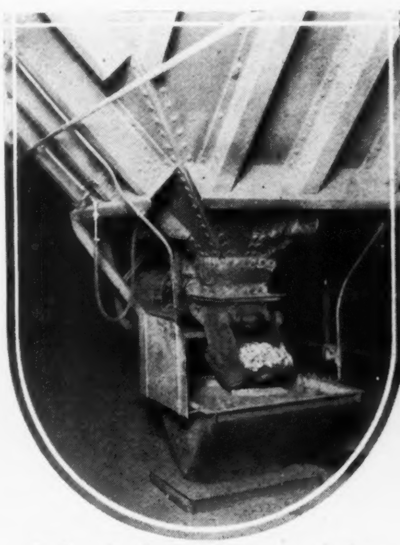
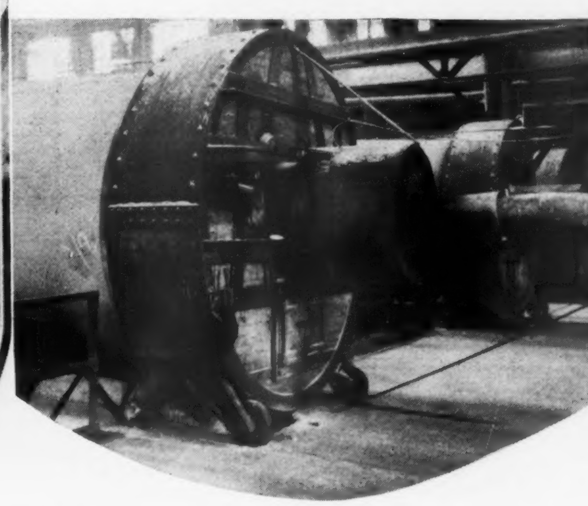
Largest Lime Plant in North America

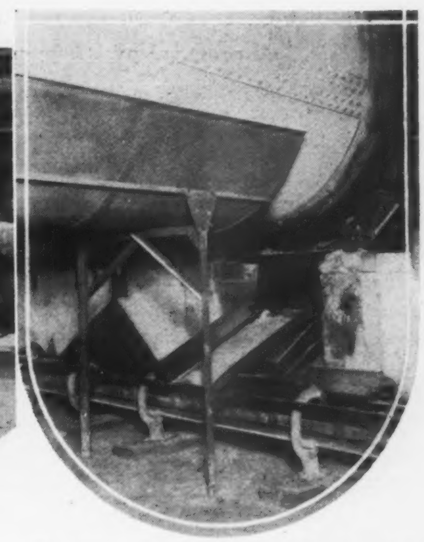
The American Cyanamid Co. at Niagara Falls, Ontario, Has a Rotary Kiln Burning Plant Presenting Some Interesting Features in the Way of Burning with Pulverized Coal, Temperature Control of the Burning, and Efficient Cooling of the Burned Lime



Swing feeder under one of the stone bins feeding a kiln



Looking across the firing floor, showing control instruments on the kiln hood



Hot lime discharging to the carrier running to the coolers

AMONG the plants which produce lime as one step in the manufacture of their final products, the plant of the American Cyanamid Co., located at Niagara Falls, Ontario, offers some interesting features. Here crushed limestone is burned into lime in a large battery of rotary kilns, using pulverized coal as fuel, and a double set of pyrometers for temperature control.

Before proceeding to a description of the lime-burning operation it might be of interest to sketch briefly the Cyanamid plant and operation as a whole.

The American Cyanamid Co. was organized in 1907, and the original plant erected at Niagara Falls with a capacity of 5000 tons of cyanamid per year. This capacity has been successively increased until it is the largest plant of its kind in the world, with a present capacity of 350,000 tons of burned lime per year.

In the process of manufacture the burned lime is mixed with crushed coke and treated in large electric furnaces which melt the mixture down to form calcium carbide. The carbide after being trapped from the furnaces and cooled and pulverized is put into electric ovens, where nitrogen gas is passed through the heated carbide and taken up by it, forming a solid mass of calcium cyanamid. This is broken up and the resulting powder is the crude cyanamid of commerce. The nitrogen gas used in the process is produced by liquefying huge quantities of air and distilling off the nitrogen.

The chemical reactions involved in the manufacture of calcium cyanamid and its use a fertilizer, including the burning of limestone in the rotary kilns, are as follows:

$$\underset{\text{(Limestone)}}{CaCO_3} + \text{Heat} = \underset{\text{(Lime)}}{CaO} + \underset{\text{(Gas)}}{CO_2}$$

$$\underset{\text{(Lime)}}{CaO} + \underset{\text{(Coke)}}{3C} + \text{Heat} = \underset{\text{(Calcium carbide)}}{CaC_2} + \underset{\text{(Gas)}}{CO}$$

$$\underset{\text{(Calcium carbide)}}{CaC_2} + \underset{\text{(Nitrogen)}}{N_2} + \text{Heat} = \underset{\text{(Calcium cyanamid)}}{CaCN_2}$$

$$\underset{\text{(Calcium cyanamid)}}{CaCN_2} + \underset{\text{(Water)}}{3H_2O} = \underset{\text{(Ammonia)}}{2NH_3} + CaCO_3$$

Crude cyanamid is shipped to various fertilizer plants and also to subsidiary plants for use in fertilizer and other chemical products, such as cyanide for the extraction of gold, silver and for ores, and for the concentration of ores, zinc and copper, and plating, case-hardening and prussets used in the paint industries, etc. The largest of these plants is at Warners, N. J., where cyanamid is combined with phosphates and potashes to form "Ammo-Phos" and "Ammo-Phos-Ko" fertilizers, both concentrated plant foods.

The fertilizer cyanamid is a fine gray powder containing about 21% of nitrogen combined with lime.

The products are shipped in special closed steel hopper cars to the New Jersey plant.

The 36-in. belt conveyor with tripper delivering stone to feed bins over the kilns

In the electric furnaces and cyanamid ovens electric power is used, in excess of 100,000 hp., which is supplied by the Hydro-Electric Power Commission of Ontario.

Raw Materials

The company owns extensive limestone deposits at Beachville, near Woodstock, about 100 miles west of Niagara Falls, Ont., and operates its own quarry and crushing plant.

The limestone is a high calcium stone, analyzing 98% $CaCO_3$, and is crushed and screened at the quarry. It is shipped by rail in hopper-bottom cars to the plant at Niagara Falls.

The company also operates a pulverized limestone plant at the quarry, producing agricultural limestone as well as pulverized stone for asphalt filler, cement filler, etc., and larger sized stone for various other commercial purposes.

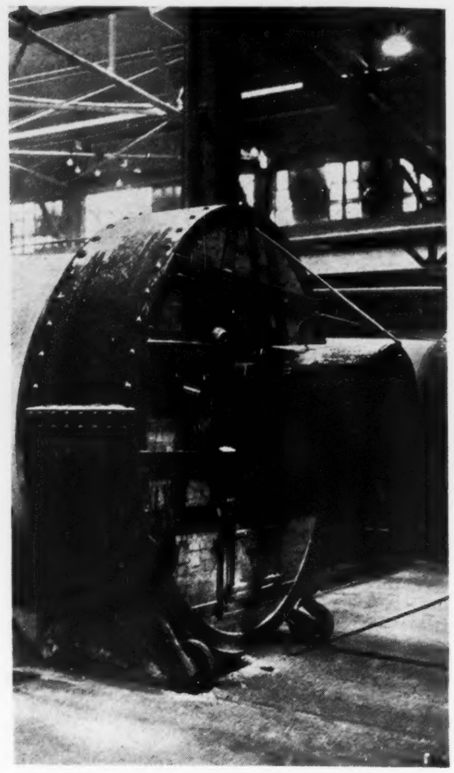
Lime Burning Plant

Until about six years ago the lime was burned in a battery of 12 vertical shaft kilns.

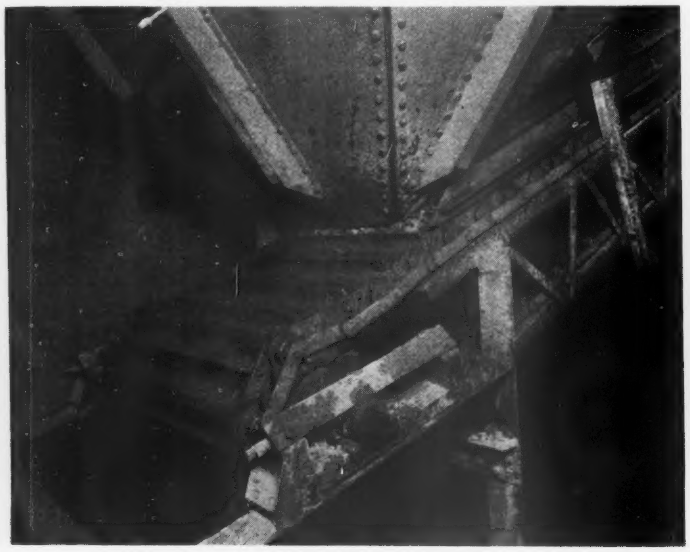
In 1924 two rotary kilns were installed, the following year a third was added, then in 1928 two more were added, and in 1929 the burning plant was again enlarged and an additional two kilns, with space provided for another. In the meantime the vertical kilns were abandoned and dismantled; so that at the present time the installation includes seven rotary kilns with space for one more.

This change from the old vertical kilns to rotary kilns resulted in a marked increase in efficiency and economy, a better control of the quality of the lime and a lower production cost.

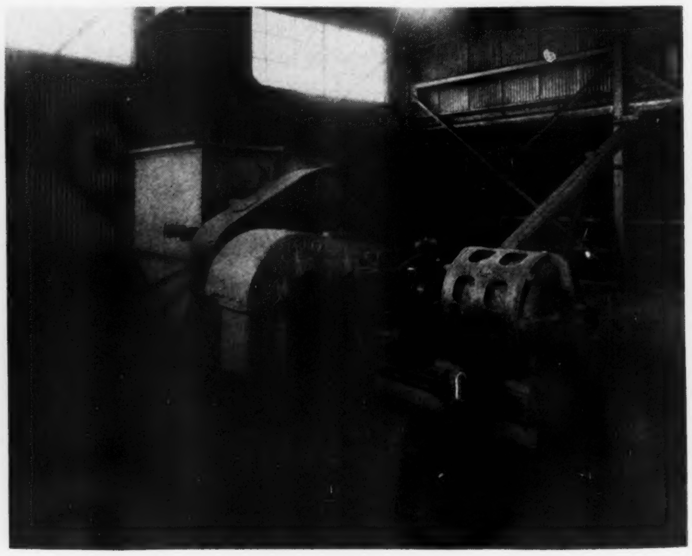
In the present operation the crushed stone arriving from the quarry in railroad hopper cars is emptied into a track hopper alongside the plant, from which it is fed by an inclined apron conveyor feeder to a bucket elevator and then to a belt conveyor with a



Firing end of the No. 3 kiln showing the radiation pyrometer on the firing hood



A 42-in. apron feeder under the track hopper delivers stone to the elevator



Head of the stone elevator showing the motor and speed reducer drive

Hot lime is conveyed from the kilns to the coolers by a special carrier

movable tripper, which extends over the seven bins feeding the kilns. The steel apron conveyor feeder is 42-in. wide by 15 ft. long, and is driven by a 5-hp. motor, through a Cleveland worm gear reducer. The elevator is a Link-Belt, steel encased 36-in. bucket elevator, 82 ft. high, with two strands of chain, and having a capacity of 300 tons per hour. It is driven by a 75-hp. motor, through a Farrel-Birmingham geared-speed reducer and one set of external gears, and has a magnetic brake on the motor shaft to prevent it running backward. It is somewhat unusual in that any adjustment in length is made at the top instead of the bottom; the bottom bearings, however, are arranged with heavy coiled springs to relieve shocks and expansion stresses.

The belt conveyor, which was also furnished by the Link-Belt Co., is 36 in. wide by 170 ft. long with a tripper, which discharges the crushed stone into the feed bins over the kilns. There are seven steel bins with hopper bottoms, having a capacity of 240 tons of stone each. Under each of these bins is a Fuller-Lehigh swing feeder with an adjustable crank arm, driven through a Cleveland worm gear reducer by a 2-hp. motor. The stone drops from the feeder into a hopper and spouts into the kiln.

The kilns are all of the same size, 8 ft. in diameter by 125 ft. long, and are driven by 40-hp., slip-ring, variable-speed motors, with the drum controllers located on the firing floor. Five of the kilns were furnished by Reeves Bros., one by the Bonnot Co. and one by the Allis-Chalmers Manufacturing Co. The actual power required to operate these kilns is 27 hp. each. They have a slope of ½-in. to the foot and are revolved at a normal speed of 1 revolution per minute. The firebrick lining is 6-in. thick; 25 ft. of high alumina brick is used at the firing end, and some very hard brick at the feed end to resist abrasion. The life of the lining is about 10 to 12 months in the firing zone, about four years on the middle section and about two years on the feed end.

Each kiln has an average output of 100 tons of burned lime per day with less than 2% of carbonate or core remaining, which is satisfactory for its use in making carbide.

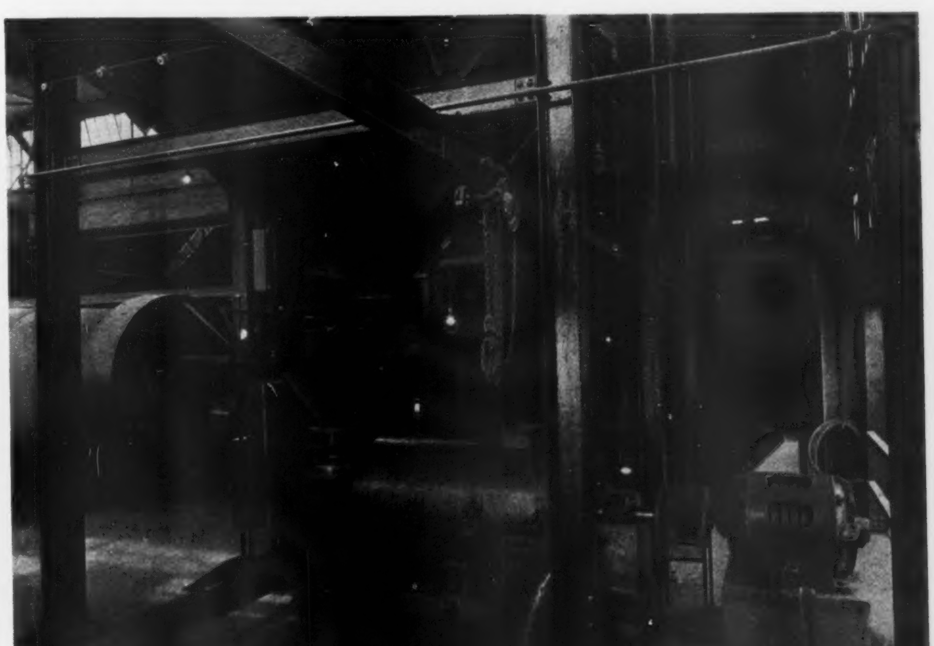
Each kiln has a 6-ft. by 128-ft. steel stack, brick lined to the top. Two 350-hp. Erie City, water-tube, waste-heat boilers, which furnish steam for heating and other purposes, are connected into the stacks so as to utilize part of the waste heat.

Fuel and Burning

Instead of pulverizing coal in a separate plant and transporting it to the kilns, it is pulverized as used by an Aero pulverizer at each kiln. There are two Size G machines and five Size F machines, each driven by a direct-connected 100-hp., 1500-r.p.m. motor. These machines normally require about 70-hp., but if the coal is unusually damp more power is required. In order to have plenty of power against any ordinary emergency these pulverizers, as well as practically all the other machines in the plant, are over-motored.

This can be done without any bad effects from the low power factor, because the furnaces use so much electric power that the motor load is only a very small percentage of the total power consumed. The electric power throughout the lime-burning plant is 3-phase, 25-cycle, 440-volts.

There is used ¾-in. slack coal from the Pennsylvania fields, the railroad cars being emptied into a track hopper from which the coal is fed on a short 18-in. belt conveyor to a 12-in. bucket elevator. The elevator discharges to a roll type coal crusher and to a 14-in. by 230-ft. screw conveyor extending over the seven coal bins, which feed the pulverizers. The 18-in. belt conveyor has a

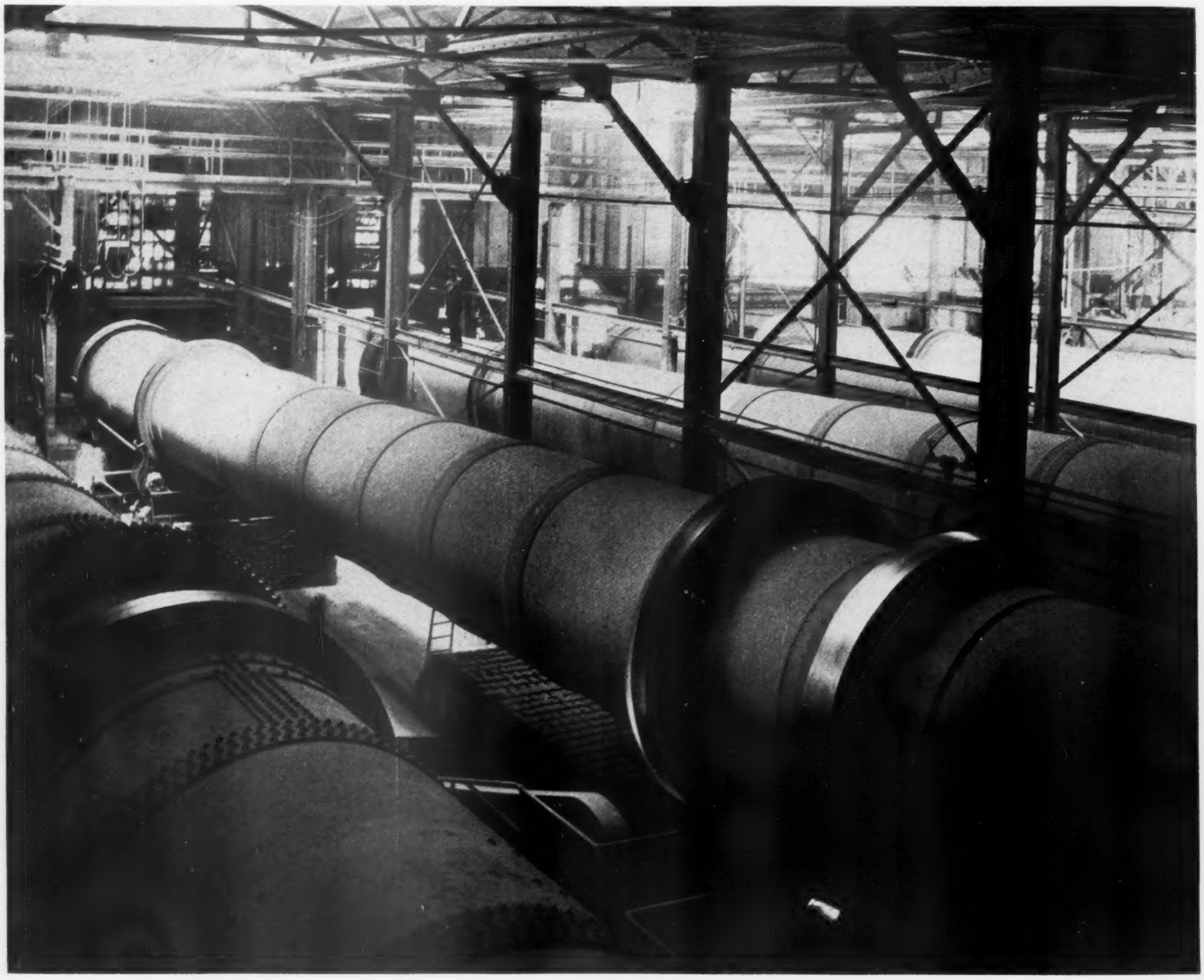


The firing floor at the Nos. 1 and 2 kilns, showing the coal grinding equipment (center foreground)

magnetic head pulley for removing any iron in the coal. The screw conveyor is in two sections, each half being driven by a 10-hp. motor through a gear reducer. The elevator is also driven by a 10-hp. motor through a gear reducer. The roll crusher is driven by a 15-hp. motor, and is used to crush all of the coal down to a size of ⅝-in. and less to insure a uniform feed to the pulverizers.

The bins which feed the pulverizers are of steel with hopper bottoms, and have a capacity of 40 tons of coal each. The coal contains about 4% of moisture and measures have been taken to dry it further in the pulverizers by utilizing some of the heat given off by the burned lime coming from the kilns. Alongside each kiln a small hood has been placed over the Peck carrier, which carries the hot lime from the kilns to the coolers, and the hood is connected by a pipe with the air intake on the pulverizer, so that heated air is drawn into the pulverizer. This air is also the means of blowing the powdered coal into the kilns in the Aero-pulverized system used.

Burning the coal directly in the kiln in this way gradually forms an ash ring which must be removed every 20 to 25 days. This is done by breaking it down with a Western Cartridge Co.'s shot gun, as has been described in a past issue of ROCK PRODUCTS, or by closing down and removing the ring by workmen entering and poking it down.



Kiln department at the Niagara Falls, Ont., lime plant, American Cyanimid Co.

A fuel ratio of better than 3 to 1 is obtained in the kilns.

Control of Calcination

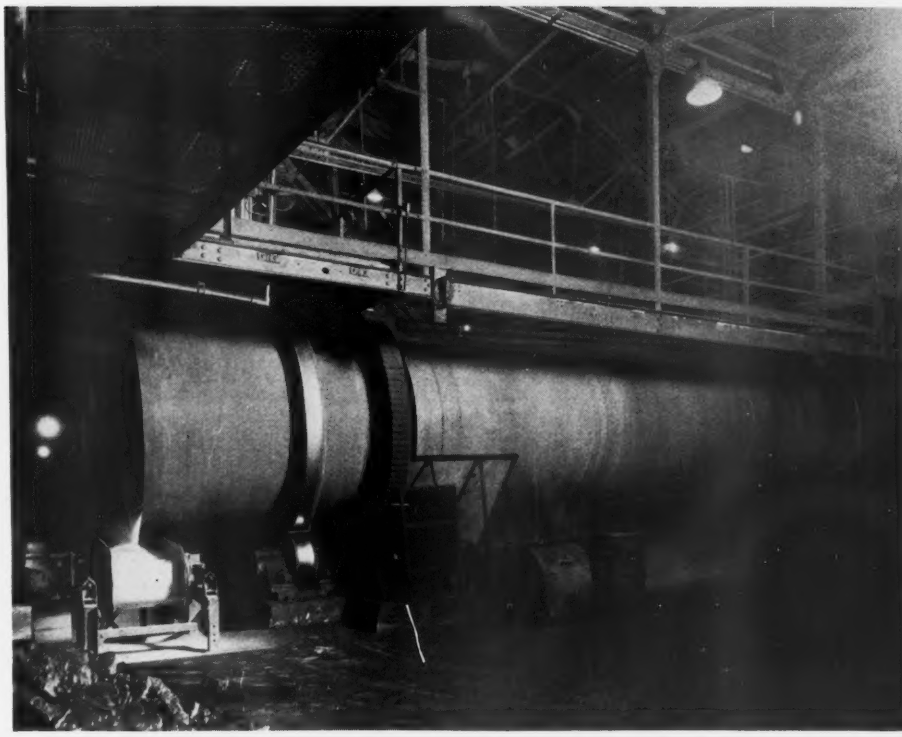
Two pyrometers are used on each kiln, one a Thwing radiation pyrometer mounted on the firing hood, and the other a Brown thermocouple located in the connection between the kiln and the stack. The instruments are both indicating and recording for each pyrometer, and are located on the firing floor at each kiln. The Thwing instruments give the temperature in the firing zone, and the Brown instruments give the temperature of the gases leaving the kilns. It has been found that this temperature or the stack temperature, as it is commonly called, gives a better indication of the burning than the temperature in the firing zone. Hence the kilns are operated in that way, holding the stack temperature at about 1100 deg. F. The temperature in the burning zone is usually from 2300 to 2400 deg. F., but may be anywhere from 2200 to 2500 deg. F. A draft gage which shows the amount of draft through the kiln is also used on each kiln.

Coolers

The type of coolers used and their location and the method of conveying the burned lime from the kilns to the coolers distinguish this plant from other rotary-kiln, lime-burning plants. For a number of years it seems to have been the practice to build such plants with the kilns supported on high concrete foundations and the coolers underneath, instead of using some simple conveying equipment and keeping the kilns down. In those plants each kiln has had its own coolers so that not so much would be gained by keeping all the equipment down on the lower level.

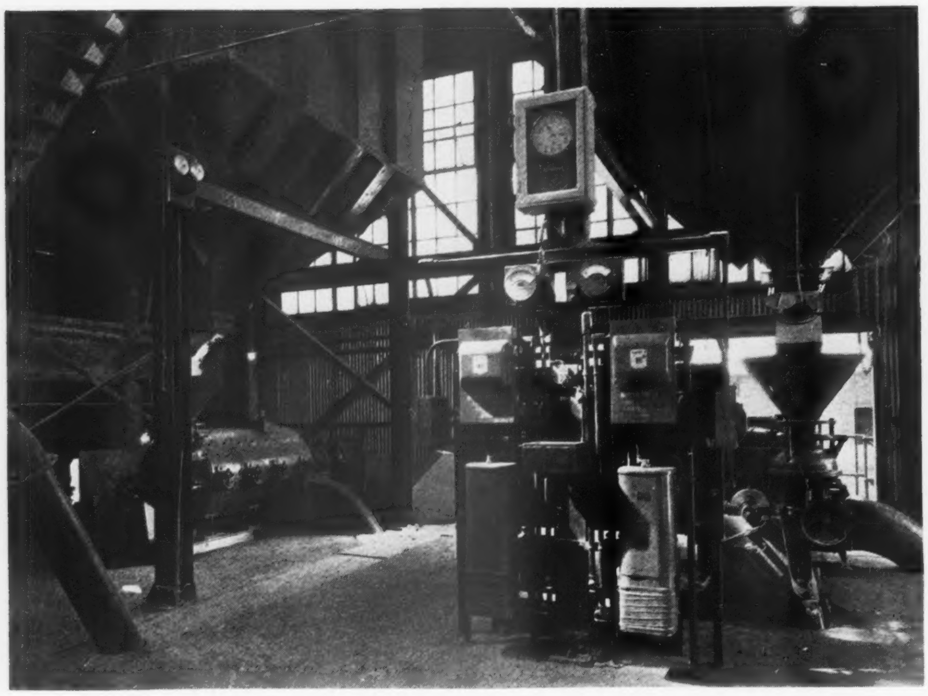
But in this plant the kilns have been kept down and the lime is conveyed to the coolers over at one side of the kiln building. The hot lime coming from the kilns is spouted to the lower run of a Peck carrier installed at right angles to the kilns, and carrying the lime over and up to a discharge point on the upper run at the edge of the building, from which point it is spouted and conveyed to the coolers. This carrier was furnished by the Link-Belt Co. and has 24-. by 24-in. over-lapping buckets of 5/16-in. steel plate. It has a horizontal run of 195 ft. and a vertical run of 30 ft., and is driven by a 15-hp. motor through a train of gears.

Three rotary coolers of a special design are installed to take care of the lime from all the kilns, and it has been found that one of these coolers will, if necessary, satisfactorily cool the lime from three kilns. The cooler design was worked out and patented by the company, and they were built for it by the Reeves Bros. Co. They are 8 ft. in diameter by 40 ft. long, supported on tires and rollers, and driven in the usual manner and arranged with a 3-ft. diameter inner cylinder, which is tied to the 8-ft. diameter main shell by six longitudinal steel plates. These plates divide the cooler into six compartments so that the load of material being cooled is divided to the six compartments, each acting as an independent rotary cooler. The 3-ft. inner cylinder is open at the ends so that there is a circulation of air through it. Over the middle section of the cooler between the supporting rings, a perforated pipe sprays the outer shell so that it carries a film of water on the outside. This water cooling in connection with the air through the inner drum is very effective, reducing the temperature of the lime passing through



One of the three rotary coolers. Note the water cooling spray on the middle section of the cooler

Firing end of the Nos. 1 and 2 kilns, showing the radiation pyrometer and draft gages on the firing hood



Motor controls for the kilns and other equipment are located on the firing floor

the cooler from 1000 deg. F. to 300 deg. F. The coolers are each driven by a 15-hp. motor through a Cleveland worm gear reducer.

From the end of the coolers the lime falls into a 24-in. Link-Belt steel apron conveyor, driven through a Cleveland worm gear reducer by a 5-hp. motor. This discharges to a 12-in. Link-Belt steel encased bucket elevator with double-strand chain delivering to a bin, from which it is conveyed to the carbide plant.

General

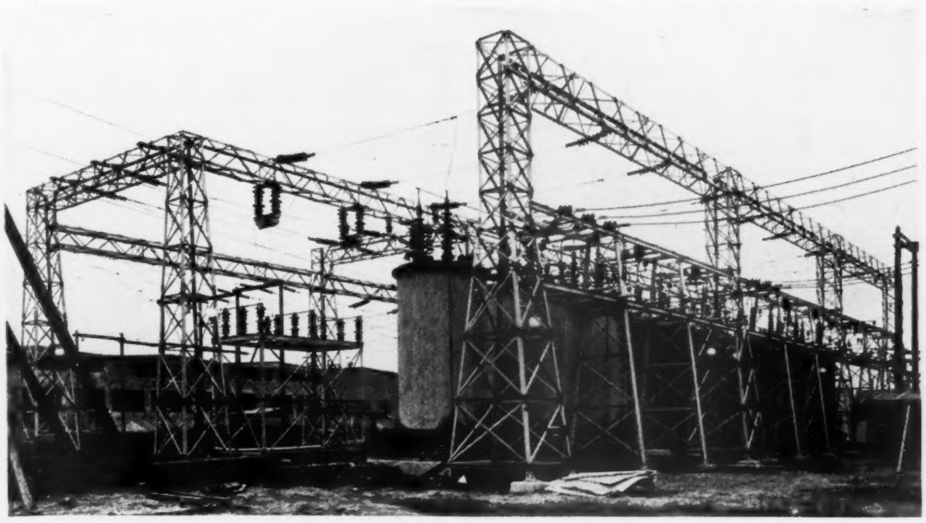
The most interesting and striking features of the plant are the pyrometer installations for control of the temperatures in the kilns and the type of coolers used, which have been described in the foregoing.

The kilns were equipped first with the radiation pyrometers on the firing hoods, but it was found that they alone did not give the desired control on the burning, principally because of the variations in the variations in the length of the burning zone from time to time.

Consequently, a further installation of thermocouple pyrometers was made at the stack end of the kilns, and it was learned that the stack temperature bears a certain relation to the calcining accomplished, and that holding the stack temperature constant gives a better way of keeping the calcining constant.

In addition to these two features, the use made of lights or "winkers," to indicate to the operators on the firing floor whether or not the remote equipment is operating, is very interesting and noticeable. These lights are flashed by contactors on some moving part of the equipment, usually one of the shafts, and indicate whether the stone feed-

Firing floor at Nos. 6 and 7 kilns. Each kiln is supplied with pulverized coal from an individual pulverizer (left); the recording pyrometer for stack temperatures is fastened to the post in the center



Part of the transformer station at the American Cyanamid Co.

ers at the kilns, the coolers and the conveyor and elevator taking the material from the coolers are all functioning. At each stone feeder a shaft with vanes is mounted in the hopper under the feeder in such a way that the stone falling from the feeder turns the shaft and through a contactor device on the end of the shaft flashes the light at the firing floor. It is possible to see from the firing floor whether the swing feeder is operating, but the "winker" gives the added information as to whether the stone is feeding regularly to the kiln or for any reason is not feeding.

The lime-burning operation is carried on with a crew of five men per shift, and another crew of five men on the day shift take care of keeping the stone and coal bins filled.

The whole operation is carried on in a thoroughly modern steel and concrete building, with everything carefully safeguarded and protected, and with all machinery controls conveniently located for ease in operation.

The American Cyanamid Co., in addition to its plants in Ontario and New Jersey, owns and operates 26 manufacturing plants in the chemical field, which includes phosphate rock mining operations in Florida, with a production capacity of over 1,000,000 tons per annum.

George E. Cox has been manager of the Niagara Falls, Ont., plant of the American Cyanamid Co. since 1913. For many years he was manager of the Niagara Falls, N. Y., plant of the Union Carbide Co. during the period of the development of the electric furnace for the manufacture of calcium carbide and ferro-alloys. He also supervised the installation of the first large rotary kilns for making lime, and the subsequent improvement in their performance.

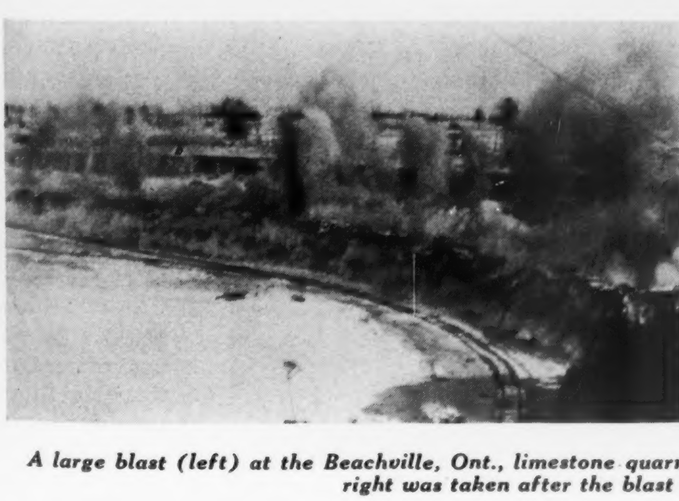
New Ohio Quarry Plant Construction Started

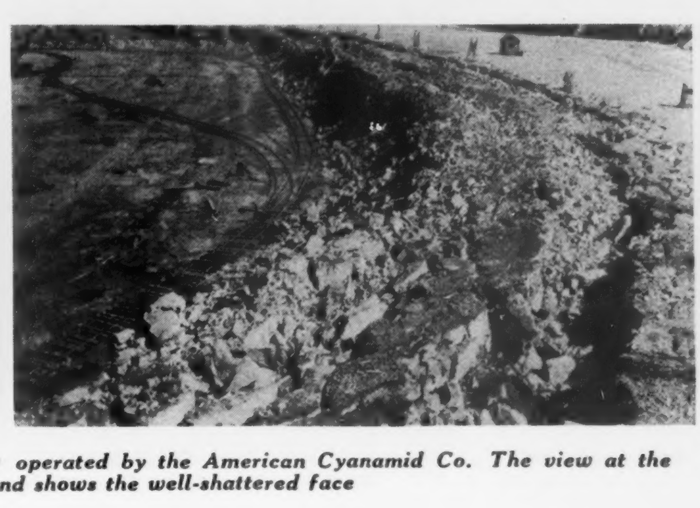
BUILDING activities were started March 16 on the grounds of the Bluffton Stone Co., recently formed Bluffton, Ohio, quarrying firm that is expecting to start operations early this summer.

Workmen have already started the construction of a building to house the crusher and screening machinery, heads of the organization announced. Stripping of the top soil down to rock, preliminary to the start of actual quarrying operations, is to be started immediately and employes of the firm expect to complete the project in record time.

Specifications for the construction of a grade crossing over the Nickel Plate railroad on a road to be built by the company were received recently and officials hope to begin work on the drive in the near future. The road is needed to provide an outlet from grounds of the company to Water street.—*Bluffton* (Ohio) *News*.

Crushing plant at the Beachville, Ont., quarry, in which pulverized limestone for agricultural purposes, asphalt and cement filler is produced





A large blast (left) at the Beachville, Ont., limestone quarry operated by the American Cyanamid Co. The view at the right was taken after the blast and shows the well-shattered face

Gypsum Industry on the Pacific Coast

Part III—The Three Plants of the Standard Gypsum Co. Are Described

By Walter B. Lenhart

Associate Editor, Rock Products

TWO previous articles in this series were published in ROCK PRODUCTS, January 18 and February 15.

The mining town of Ludwig, Nev., is located about 100 miles south of Reno, Nev., and 17 miles by road from Yerington, Nev., although the straight, air-line distance between these two points is about 8 miles. The plant is located at the terminal of the Nevada Copper Belt Railroad, the other terminal being at Wabuska, and connects with the branch line of the Southern Pacific running between Sparks and Goldfield, Nev. Ludwig can also be reached from Reno over the line of the Truckee River R. R. by transferring at Mound House, Nev., to a second spur of the Southern Pacific that connects with the first mentioned line of the Southern Pacific at Churchill Junction, Nev.

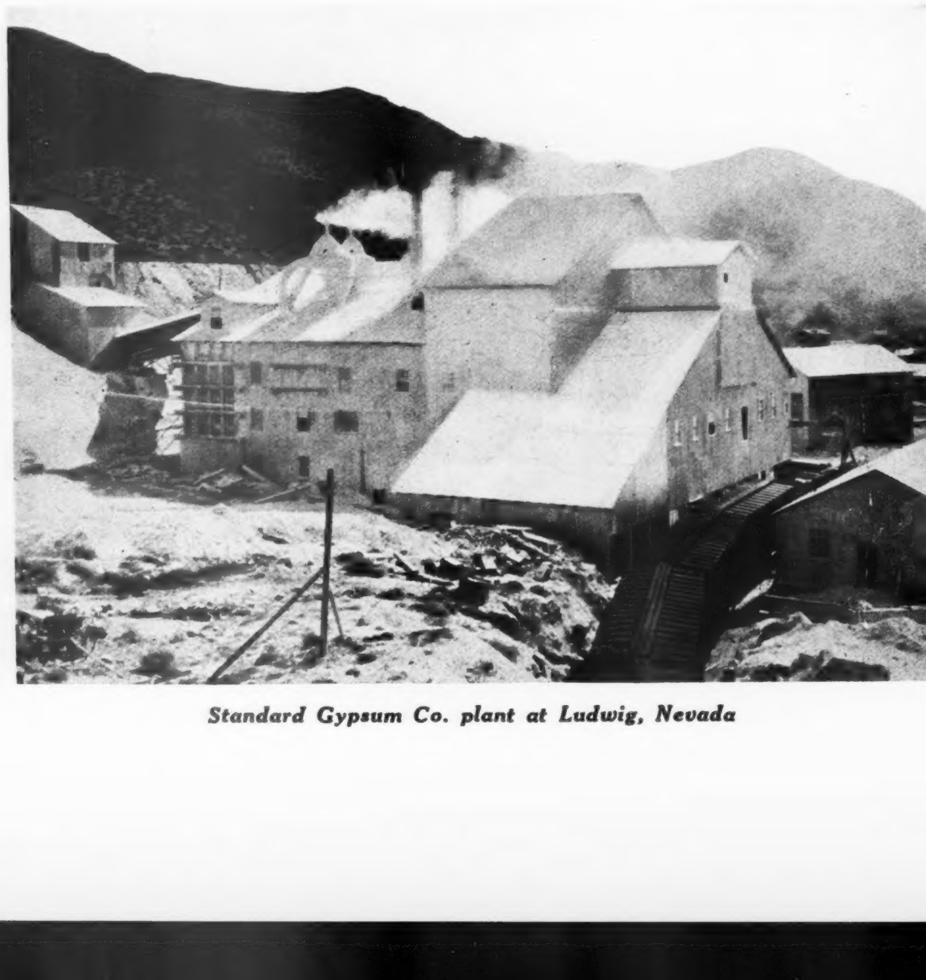
Ludwig is known more or less throughout the mining industry as a copper-mining camp, where are located the mines of the Nevada Douglas Copper Co., now not operating, but before and during the war that company operated quite extensively and employed several hundred men. During that time the copper company erected many homes for its staff and living quarters for the men, and these homes are now used by the employes of the Standard Gypsum Co. Copper mining must have been profitable as many of the homes are very modern, finished in hard wood, have furnaces, etc., so that the gypsum company was fortunate in not having to build a single home or building for its men.

In 1912, while Sam Arentz, who is now congressman-at-large from the state of Nevada, was superintendent for the copper company, he purchased in the company name some gypsum claims adjoining the copper mine, and it is common gossip that Mr. Arentz at the time was placed in quite a jamb by these purchases; but evidently he was much more far-sighted than his old employers, for the copper mine has long ceased to be a producer while the gypsum property has steadily for years been a source of income to its owners.

The Pacific Portland Cement Co. at one time leased these deposits from the copper company and shipped the gypsum to its old mill, now dismantled, at Mound House, Nev., and when it gave up its lease a company headed by Martin Uldall and Wallace Riddell reopened the property and built a two-kettle plant immediately alongside of the deposit. At the time the plant was built market conditions were very favorable and prices good, so that the new plant was taxed to its capacity. Late in the same year the plant was enlarged to a four-kettle operation, and was operated during its early life to full capacity.

The deposit, several years before the Standard Gypsum Co. took it over, had been core-drilled, showing up an enormous tonnage of high grade gypsum, all lying so close to the surface that open-pit operations were conducted for reclaiming the gypsum. This method still continues, although at one time the company planned on mining by the caving or glory hole method, and a shaft some 115 ft. deep was sunk near the center of the deposit and a short drift started from the bottom of the shaft. In the bottom of the shaft no water was encountered, but while drifting at about 25 ft. a large volume of water was encountered, the water shooting out of the drill holes into the drift for several feet. It is interesting to note that the shaft and drift were all in high grade solid rock gypsum, at all times, and just before stopping the drifting operation several small pieces of coal were found embedded in the gypsum.

Quarry operations were first conducted using the hand-loading system with stripping done with a ½-yd. P. & H., semi-crawler, gasoline-driven shovel, but later a No. 206 ¾-yd. shovel of the same type, except that it was full crawler, was purchased and was used for loading the rock. As the overburden consists of dirt and gravel, and owing to the uneven surface of the gypsum this overburden could not be cheaply removed. Even during hand loading some of that foreign material was shot into the quarry floor, but it could be separated by hand loading readily. However, when the power shovel was used for loading it became necessary to devise a method of separating the gravel from the gypsum. To accomplish this the rock was hoisted in cars and dumped over a grizzly with 2-in. spacings, the oversize falling to a pan conveyor that delivered the stone to a 24 by 34-in. Ehrsam jaw crusher. All the material that passed through the grizzly was considered as waste and was rejected; and if there was any oversize that was not suitable for the mill it was removed by hand picking from the pan conveyor. This system worked fairly satisfactorily,



Standard Gypsum Co. plant at Ludwig, Nevada

but was later abandoned as it was considered that too much gypsum was being wasted and the quarry is now operated by hand loading entirely. Another factor that made the use of power shovels uneconomical was that, owing to the dip of the lodge, repeated sinking or lowering of the quarry floor became necessary. The larger shovel is now used for stripping and loads to Western type cars, which are hauled to the waste dump by a Plymouth locomotive.

Drilling is all done in the quarry with Ingersoll-Rand Jackhamers, using lifter holes entirely, as experience with down holes has never proved satisfactory. Hercules 40% gelatine dynamite is used, with fuse and caps as the exploders. Any large pieces of gypsum are split with an Ingersoll-Rand paving breaker equipped with a chisel bit, and it works quite successfully for that purpose.

The gypsum after passing the initial jaw crusher falls direct to a 42-in., Ehrsam rotary crusher, placed to deliver a ¾-in. product. The two crushers are driven by a single 75-hp. induction motor. The crushed gypsum falls to an 18-in. belt conveyor that delivers to a short shuttle conveyor, mounted over the raw work bins. Formerly a screw conveyor was used in place of the shuttle, but that was troublesome for the excessive strains sheared off the conveyor coupling pins.

A crusher of the above type, when equipped with new muller and casings, gave a screen analysis as follows:

Plus 1-in.	4.0%
Plus ⅜-in.	32.0
Plus 10-mesh	15.0
Plus 30-mesh	9.3
Plus 60-mesh	17.5
Plus 80-mesh	5.3
Plus 100-mesh	5.6
Minus 100-mesh	11.3
	100.0%

Many of the cement mills on the Coast require that the gypsum be sized to ¾-in. with all fines and oversize removed, and to supply that material a small trommel screen has been installed at the head of the belt conveyor. It is so located that the fines and oversize fall to the Raymond mill feed bins, and the ¾-in. to a small bin from which the rock is drawn to cars and delivered to the main gypsum storage line alongside the standard gage track. Standard gage gondolas from this bin are loaded by gravity from chutes.

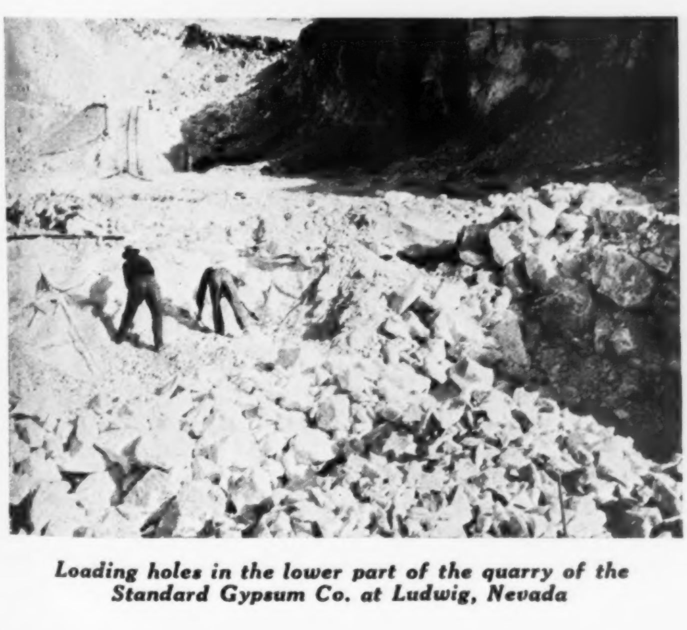
Upper part of the Ludwig, Nevada, quarry

There are three, low-side, five-roller Raymond mills directly under the mill storage bins. The mills are all equipped with the usual automatic feed, fan and cyclone dust collectors. Likewise the mills all are belt-driven from individual motors, with fans mounted on the second floor, but directly connected to their drive motors. A 50-hp. motor is required for the mills and 40-hp. on the fans. The cyclones are vented to the atmosphere.

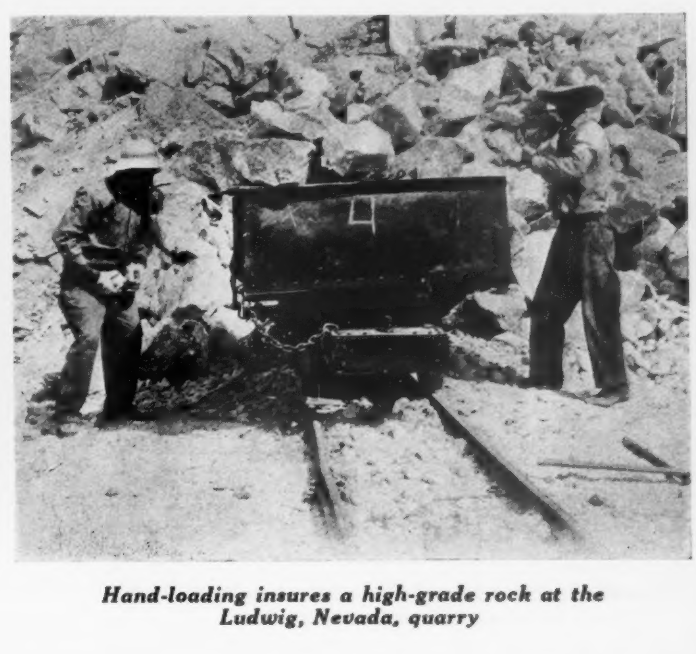
The cyclone discharges to a screw conveyor, resting on top of the kettle feed bins, delivers to any of the four kettle bins, with directional flow of material being changed by crossing the conveyor's drive belt.

There are four 10-ft. Ehrsam kettles with a 2-ft. extension top with four flues each, two above two, and the usual Ehrsam stirring mechanism. Chains have been replaced with cast-iron, egg-shaped rollers, through the long axes of which passes a ⅜-in. hole, and these "eggs" are strung on a suitable wire cable. This drag has proven to be very successful and outlives the life of several chains, as the "eggs" tend to roll instead of drag over the bottoms. Cast-iron sectional bottoms were first used but have been replaced with steel. Fog boxes have been dispensed with and the steam from the kettles is simply carried to the atmosphere by a 24-in. by 24-in. vertical wood stack. Draft in the fog stack is controlled by a suitable damper.

On one of the kettles the wing walls were removed, more or less as an experiment, because it was contended that the



Loading holes in the lower part of the quarry of the Standard Gypsum Co. at Ludwig, Nevada



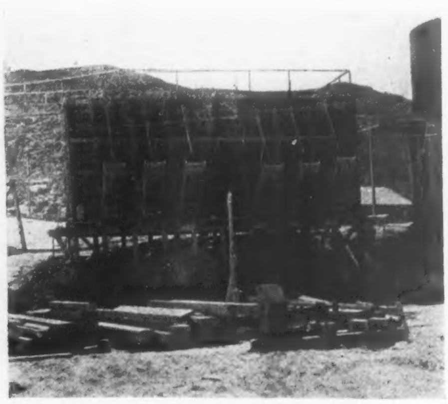
Hand-loading insures a high-grade rock at the Ludwig, Nevada, quarry

Head frame over development shaft at Ludwig, Nevada

dust that usually accumulates on these walls offsets any value that they might have in deflecting the heat, so as to make it pass twice around the kettle before discharging to the stack. When the kettle was equipped with the dampers as previously mentioned there was no noticeable change one way or the other in the oil consumption due to this change. The elimination of gypsum kettle wings walls eliminated troublesome jobs in attempting to keep them clean and also did much to preserve the kettle brick walls, for expansion of the kettle always did tend to crack the brickwork due to the wing wall pressing outwardly against the brickwork.

The kettles are all loaded by two short screw conveyors mounted under each kettle's feed bin, the conveyors being driven from a countershaft that is in turn driven from the bull gear drive shaft. The kettle drives are belted to 25-hp. motors.

Oil is used for fuel with air from a type T, General Electric low pressure centrifugal compressor. This type of air supply has been in operation practically since the plant started and has proven quite efficient. In connection with the firing operation a novel fire door has been devised by Fred Bradfield, superintendent. It is the practice to shut off the oil during the dumping operation to insure no excess heat being applied to the bottoms while the kettle is empty. It was found that this cooled off the kettle appreciably unless the fire damper and stack damper were closed at that time, so to make the two operations easy for the calciner the lower fire door damper is connected to a butterfly stack damper by a suitable chain, so that closing the lower damper also closes the stack damper. A second slide damper is used in the stack to control and prevent heat losses during the calcination. By the use of this simple but efficient device it was said that oil consumption had been lowered about one gallon per ton of stucco.



Bunkers for storage of cement rock at Ludwig, Nevada

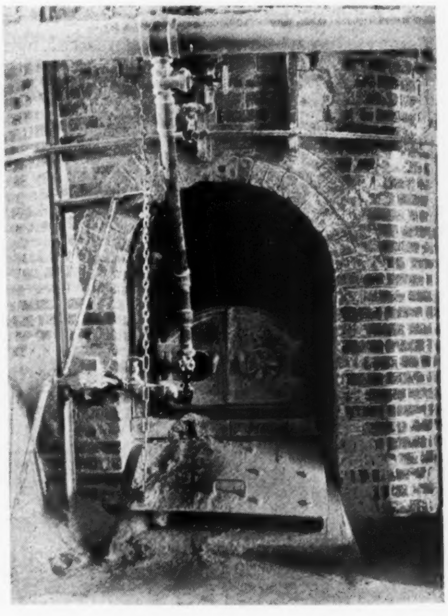
Jack Fell, assistant quarry foreman, and Fred Bradfield, superintendent, Standard Gypsum Co., Ludwig, Nev.

The kettles are discharged to individual concrete hot pits through a double gate. The first gate was supplied with the kettle, but a second has been placed below and in a parallel plane, and it is the practice to fill in the intervening space with calcined cold stucco, so that in the event the first gate leaks the packed stucco and second gate stops all leakage.

The hot pits are all provided with Ehrsam hot-pit emptiers, four screws per pit, and these discharge to a 12-in. screw conveyor serving a bucket elevator (6 by 12-in. buckets), which delivers to a series of screw conveyors mounted over the stucco bins. There are two main bins with partitions in each so that one section can be drawn while the others are being filled, also the bins are lined with sheet iron so the bins are self cleaning and no stucco can hang up and become aged before being sacked. The ageing of stucco in the bin has been studied carefully and no material is allowed to accumulate in these places. The hot pit and elevator are both driven from individual 15- and 20-hp. induction motors respectively.

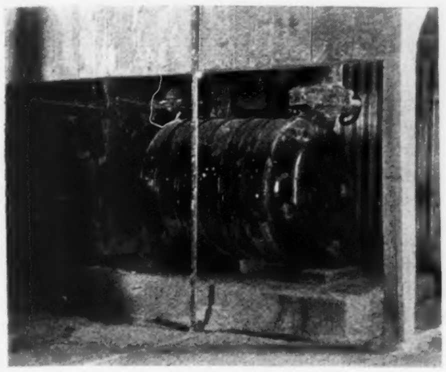
There are three, three-tube, Bates packers, two of which are used for fibered hardwall exclusively and the third for the non-fibered or other higher grade plasters, with a fourth, two-tube packer for sacking agricultural gypsum. The three-tube packers all set directly under Ehrsam one-ton mixers equipped with standard Ehrsam automatic weighing hoppers and cast-steel paddles. The three-tube sackers are motored with 15-hp. induction motors as are each of the mixers. The two-tube sacker requires only 7½-hp.

Until recently the spill from the sackers was allowed to fall to a hopper under the sackers, to which was connected a fan, and the recovered plaster was delivered to a cyclone collector mounted near the roof. The cyclone discharged back to the weighing hopper. This was not satisfactory, as it required considerable care to get the entire system cleaned out, when it was desirable to change from sacking one kind of plaster to another. Again, there were dust losses and the possibility of returning to the system, plaster that had been thoroughly aerated and consequently aged to some extent. Now the spill is collected in this same hopper below the sackers but is elevated by a small bucket elevator that is located directly behind each mixer and discharges direct to the steel hopper between the sacker and the mixer. In other words, the spill is returned to the closest possible place between its point of loss and the sacking tubes and not passed through the entire sacking system. It is obvious that with this arrangement, in the event it is desired to change from one class of plaster to another, the entire mixing and sacking system does not have to be cleaned up.



The lower damper is regulated from the kettle charge floor

Manila rope fiber is purchased in bales; no hair fiber is used at this plant or at any of the plants on the Coast for that matter and the proper amount is weighed out just prior to adding it to the mixer. The Ehrsam fiber picker is so mounted that it delivers direct to the mixer, due to the "throw" of the picker. This method has several advantages, the first of which is that the mixer operator requires no extra help to pick the fiber; it is thrown into the mixer in an even stream and insures even and thorough mixing, and also the fire hazards incidental to having loose fiber around are eliminated. The baled fiber is kept in a separate room away from all possible sources of fire and is brought to the mixer floor only as needed.

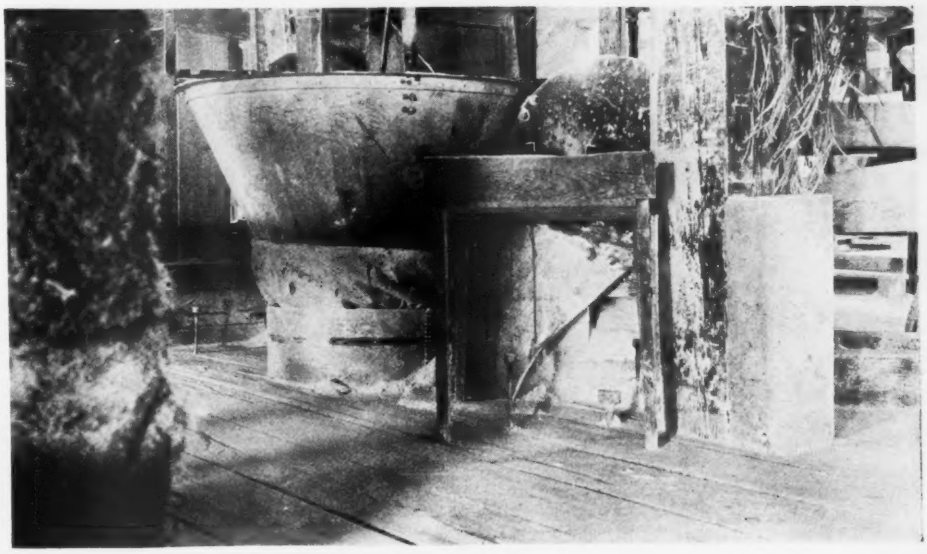


Rotary compressor supplies air for kettle oil burners

Retarder is purchased from the National Retarder Co. in car lots, but before use is screened through a ⅛-in. mesh stationary, horizontal screen that acts as the top to a small storage box. The box is about 4 ft. by 8 ft. and 18 in. deep, and is filled each morning by the operator in such a manner that the retarder is laid down in thin layers in this box. By taking the retarder from the end of the box a cross-section is secured, from several sacks, so that were there any inequalities in the strength of the retarder this would be offset, in a measure, by the method of handling.

When making fibered hardwall, and that represents the bulk of the shipments, another novel method has been devised to insure the presence of the retarder. This consists of fastening the retarder scale pan and the fiber scale pan together by a short chain so that the operator has to dump both at the same time. It can readily be seen then that if there is fiber present in the plaster, the retarder from necessity is also present.

No acoustical plaster is made at this mill but considerable land plaster or agricultural gypsum is shipped into California. The tonnage of this material being shipped has gradually increased during the past few years. Also considerable plaster is shipped to New Zealand in paper-lined jute sacks.



Fiber picker discharges direct to mixers

All sacks are sorted and repaired by contract, the company supplying Singer, type 45K74 machines, as well as a Guthat sack cleaner for cleaning only those sacks that are to be repaired.

Power is purchased from the Truckee River Power Co. and stepped down to 440- and 110-volts in company-owned transformers.

The offices of the Standard Gypsum Co. are in the Phelan Building, San Francisco. Martin Uldall is president and Wallace Riddell manager. Fred Bradfield is superintendent at the Ludwig plant with Charles McKensie, quarry foreman.

Chains tie the retarder and fiber scale pans together

Long Beach Plant of the Standard Gypsum Co.

This three-kettle plant was built in 1924-25 as part of that company's expansion program involving the building of a third plant at Seattle and the opening of a mammoth deposit of gypsum rock of high grade on San Marcos Island in the gulf of Lower California. This expansion included the absorption of the old plant of the Pacific Gypsum Co. at Tacoma, which was dismantled. Rock from San Marcos Island is delivered to this plant in boats chartered from the Alaska Mexico Transportation Co. and is first crushed to 4 in. and smaller before loading.

The boats are unloaded by a gantry crane and clam-shell, which discharges to a reciprocating feeder serving a belt conveyor running under the wharf. This conveyor in turn delivers to a belt bucket elevator that discharges to a second belt conveyor running over the top of the enclosed stock pile, the belt being discharged by a power-driven tripper. The rock is reclaimed by an 18-in. belt conveyor running under the stock piles, through reciprocating pan feeders, that

Collection of dust at hammer mill discharge, Long Beach plant

Unloading steamer "S. A. Perkins" at Long Beach plant of Standard Gypsum Co.

drives in conjunction with belt tighteners. The motors are all supplied with indicating ammeters so that the calciner at all times knows just exactly what load his kettle motors are pulling, consequently sticking of kettles from too fast loading is eliminated. The kettles are placed back about 10 in. from their respective hot pits, and are so arranged that any gate leakage falls to the floor and does not become mixed with the finished stucco in the pit. The hot-pit emptiers, bucket elevator and conveyor, are in principle the same as at the Ludwig plant previously mentioned.

There is one three-tube sacker used exclusively for fibered hardwall, one two-tube Bates packer for agricultural gypsum and one three-tube packer for the higher grades of unfibered plasters. The mixer over this third packer is equipped with water sprays for producing artificially aged casting plaster, using the patented process that was developed by Mr. Riddell and S. McAnnally, former superintendent of the Ludwig plant.

The plant produces acoustic plasters, using pumice particles sized to about 10-mesh as a base, mixed with hardwall plaster and other ingredients in such proportions that the resulting wall will be porous. At first, attempts were made to sack this product in the ordinary Bates packer, but on account of its coarseness it would not flow through the tubes, so a short screw conveyor was attached to the hopper over the sackers and at a point directly behind the front of the

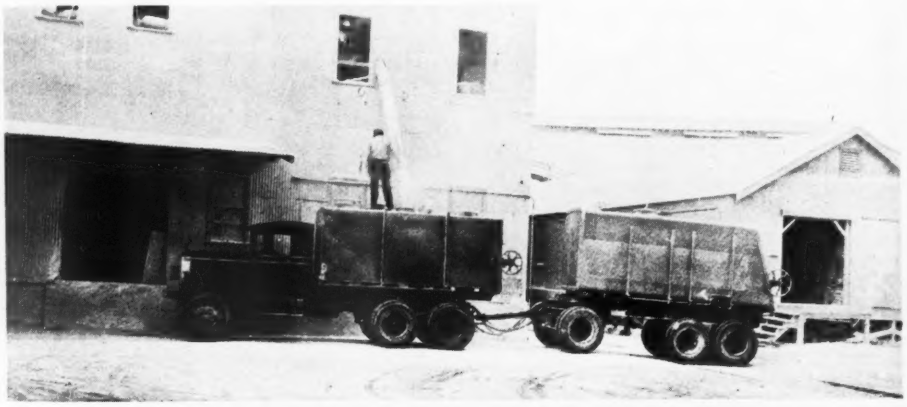
are driven from two parallel cables from the carrier conveyor drive mechanism. The gates are spaced at about 10 ft. centers through the length of the tunnel, but it is customary to use only three or less feeders at one time.

Recently a Pennsylvania hammer mill was installed to replace the rotary crusher. This mill delivers a minus ⅝-in. product with a high percentage of fines and has a capacity of at least 60 tons per hour. Some dust was experienced at the point where this hammer mill discharged to the off-bearing belt conveyor, so a small fan and cyclone dust collector was afterwards installed to correct this condition.

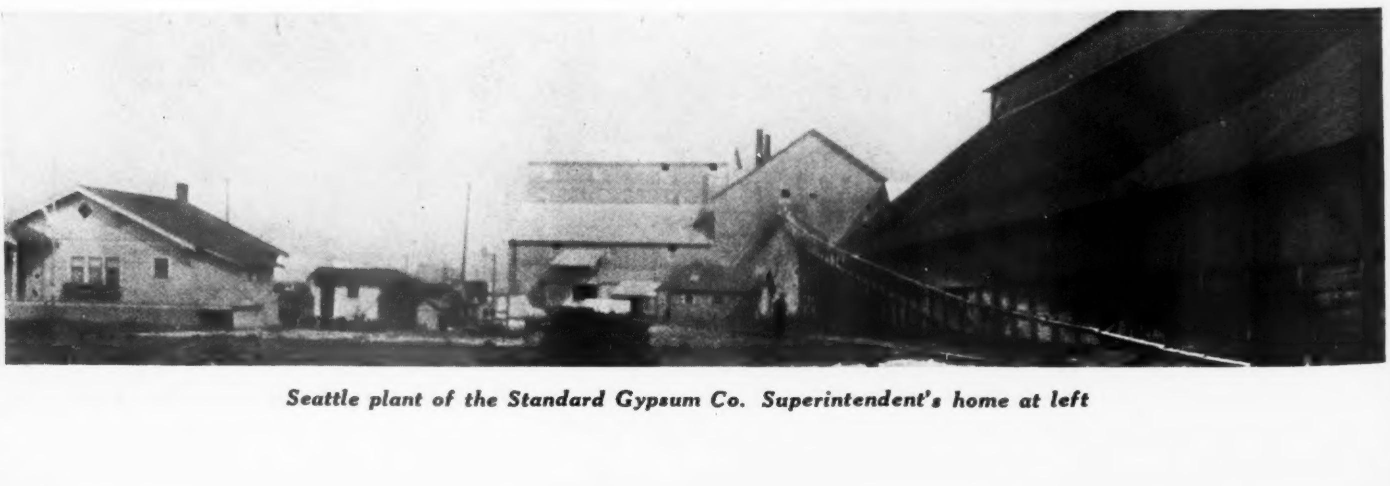
At one time it was thought that a Raymond mill required a certain amount of 1½ to 2-in. material in the feed as a bank material as otherwise it was apt to run noisily, but that theory was exploded by this installation, at least, for the mills run very quietly with practically no attention. At times it was necessary to remove tramp iron from the Raymond mills but this has been overcome to a great extent by the hammer mill throwing out such foreign material.

From the hammer mills the crushed gypsum is elevated and conveyed to the tops of the storage bins serving the two low-side, five-roller, Raymond mills. On top of this bin is also located a short rotary screen for preparation of gypsum chicken grits, two sizes ordinarily being produced. One size approximating the size of corn and the second about that of millet. These two products are spouted to separate bins and are hand-sacked from spouts. The two mills are directly connected to their drive motors with the fans resting on a raised platform alongside.

There are three gas-fired kettles similar to those in the Ludwig plant, except that they are driven from short center



Loading gypsum stucco for bulk haulage at Long Beach, Calif.



Seattle plant of the Standard Gypsum Co. Superintendent's home at left

packers. This screw conveyor draws the material out of the packer feed hopper and discharges direct to three hand-sacking spouts. Paper bags of the multi-wall type are used for sacking the acoustic plasters.

There is in use a rather novel method of driving the two Bates packers used for packing hardwall, casting, etc., in fact, all plasters except the agricultural gypsum. The use of 50-cycle electric current in Long Beach made it impossible, without having special motors built, to drive the packers by direct connection at the desired speed for gypsum plaster, so the driving motors are connected to the packer by Morse silent chain drives.

Colored acoustical plasters of this type are also made by the Standard Gypsum Co. but are not mixed at the mill. The proper amount of coloring material is supplied separately in small paper bags in sufficient amounts to give the desired shades. The small sacks contain enough coloring material for one sack of the acoustical plaster.

It was at this mill that the original experiments were conducted by W. C. Riddell and Wm. Senseman, western manager of the Raymond Bros. Impact Pulverizer Co., wherein a method was developed of calcining and grinding gypsum at the same time. The process consists, in essence of enclosing the hammer mill in a suitable fire box, heating the entire mill and air supply so that the gypsum is calcined as it is ground. This calcining mill is very satisfactory for producing stucco for wall-board, but for hardwall plaster more work is yet to be done before making any definite statements. (It is interesting to note that the Santa Cruz Portland Cement Co. is using one of these installations, but of a larger size, to calcine its gypsum before adding it to the clinker.)

The plant is served by the rails of the Pacific Electric as well as facilities for truck loading. Bulk stucco is shipped by truck to Los Angeles from this plant.

The plant is located at 1301 Water street and on the inner harbor of Long Beach. J. C. Hassel is superintendent; Frank Dailey, mill foreman.

Seattle Plant of the Standard Gypsum Co.

At the same time that the Long Beach plant was built a third plant was built by the company at Seattle, located at 1871 16th avenue, S. W., in the Harbor Island district. This plant is practically the same as the Long Beach plant except that the dock is much smaller, and Butterworth and Lowe rotary crusher instead of the hammer mill. This crusher is one taken from the old Tacoma plant and has been in operation for about 15 years and still doing good work.

There are two Raymond pulverizers and two 10-ft. Ehrsam kettles and two three-tube Bates packers mounted under individual one-ton Ehrsam mixers. The Raymond mills are driven with leather belts from short center drives using Climax belt tighteners. C. O. Bunker, superintendent, states that leather belts are much more efficient than any other type that he has used.

The plant is laid out so that shipments can be made by rail, truck or by water.

Improving Low Grade Bauxite

BAUXITE is the subject of Bulletin No. 312 of the U. S. Bureau of Mines, Department of Commerce. It is especially interesting as an exposition of the possibilities of improving the quality of the low grade bauxites of the southeastern and southern states, but it also includes a good digest of what is known of the origin of deposits, their occurrence in this and other countries and the future of the industry.

There seems to be two kinds of bauxite, according to the authorities quoted, the bauxite that is left after the weathering and leaching of certain rocks and that which is deposited from water. A third class might be made of the bauxite which is transported by water and redeposited. The Arkansas deposits are of the first and third classes, while the deposits of Tennessee, Georgia, Alabama and Mississippi are of the second class. The differences are such that the commercial value and the possibilities of improving the natural product are both affected.

About 58.1% of the domestic production goes into metallic aluminum, 22.4% into aluminum abrasives and 19.4% into the chemical industry. For making aluminum the bauxite must be below 6% in silica, 4% in TiO_2 and below 10% in Fe_2O_3. For abrasives a bauxite with less than 5% of silica and less than 5% of iron oxide is wanted, although more of these do not affect the product as the silica and iron are fused together. But the titanium dioxide should not be more than 3% or 4%. The chemical industry does not care for high silica bauxite because it takes more acid but it can use bauxite with as much as 19% of silica if the iron content is low. As the iron oxide content should not be more than 3%, it is high iron that usually bars the bauxite from the chemical industry, just as it is high silica that bars it from the metallic aluminum market.

High-alumina cement is a comparatively new market for bauxite and its needs are not yet understood. The bulletin states that judging from the composition of high-alumina cement it should be possible to use bauxites with as much as 11% or 12% of silica and 15% to 20% of ferric oxide. A quotation from Anderson states that the use of alumina cement would insure an outlet for a considerable tonnage of lower grades of bauxite.

From the figures given in the bulletin it appears that development of the domestic bauxite is hampered by the fact that bauxite may be imported at a cost that makes it a strong competitor, especially in the higher grades. Imports are increasing rapidly and at the time the bulletin was written they were about equal to the domestic production. The small tonnage that goes into high-alumina cement is all imported.

The possibilities of improving low grade ores by the simple methods of washing and screening are shown to be limited to a few cases, although washing is successfully applied in some South American mines. Both washing and screening have been tried at various mines in Alabama, Georgia and Tennessee, but the improvement in the product did not justify the cost. Table concentration appears from the very extensive float and sink tests reported to be of no avail, the silica being too closely combined with the aluminum mineral. But some bauxites having a high iron content might be prepared for the chemical market by classification and tabling with a fairly good recovery.

Flotation promises greater commercial possibilities. Many bauxites that are too high in silica to be marketable are so close to the border line of the specifications that a comparatively slight improvement would make them marketable. Furthermore, flotation concentrates might perhaps be sold as "pulverized bauxite." The prices quoted in the bulletin are $7.50 to $8 per ton f.o.b. Georgia mines for bauxite of chemical grade, but for the same material dried and pulverized so that not more than 10% to 20% remains on 100-mesh and 50% to 60% passes 200-mesh the quotation is $14 per ton. Under ordinary circumstances flotation concentrates would be fine enough to pass these specifications. The bulletin states that while many of the high silica bauxites are of such a nature that they could not be made to yield concentrates with less than 5% of silica, so that they could be sold for making aluminum, they might be made into material that would do for the chemical industry.

Protection of Mortar or Concrete Against Frost

THE Department of Scientific and Industrial Research, Westminster, England, has published in Special Report No. 14, "The Use of Calcium Chloride or Sodium Chloride as a Protection for Mortar or Concrete Against Frost," a summary of various investigations on the subject.

The report states that both of these salts when added in suitable proportions to the mixing water afford protection to a limited degree of frost during the early setting and hardening periods. Sodium chloride was found to cause efflorescence on the face of concrete and calcium chloride tends to produce discolorations, according to the report. The use of neither salt was recommended for use with aluminous cements. Several serious disadvantages produced by these salts on concrete are stressed.

Copies of the report are available at 9d. (about 18c.) from H. M. Stationery Office, 16 Old Queen St., Westminster, Eng.

New Department Meets Favorable Reception

THIS new department of ROCK PRODUCTS, established in the March 15 issue, has already met with considerable favorable comment. While the announcement was directed more specifically to chemists in the portland cement industry, we take this early opportunity to assure all chemists in the rock products industry — lime, gypsum, crushed stone and all—that their contributions are also desired and will be gladly accepted.

Chemistry is assuming a more important role in all the rock products industries, including the aggregate industries, of which we will have more to say in a later issue. In the portland cement industry, if the special sub-committee of the American Society for Testing Materials under the chairmanship of Thaddeus Merriman has its say, specifications for portland cement will have chemical formulas written into them. The percentages of magnesia and gypsum are already fixed in A.S.T.M. standard specifications.

That there are plenty of problems in cement manufacture, largely of a chemical nature, yet to be solved, is attested by our British contemporary, *Cement and Cement Manufacture,* which has this to say:

Problems Awaiting Solution

"There is still great scope for investigations leading to improved quality of product and greater economy in manufacture, and the following is a list of some of the problems awaiting solution:

"(1) It is yet to be discovered what are the ideal proportions of lime, silica, alumina and iron oxide in portland cement.

"(2) A cement is needed which will chemically combine with all the water mixed with it to make a paste so that no free water remains to evaporate and cause the crazing and contraction cracks which so frequently disfigure concrete surfaces.

"(3) Portland cement liberates hydrate of lime during setting; this is a source of weakness and a cause of the so-called fading of colored concrete.

"(4) As the strength of portland cement is apparently due to the lower-limed compounds remaining after a certain amount of lime is set free, why should it be necessary to produce a cement containing 63% of lime in the first instance?

"(5) A lining-block for rotary kilns is needed that will withstand successive heating and cooling without loss of thickness.

"(6) Means for the rapid transmission of heat from flame to raw material are needed to reduce the inordinate dimensions which modern rotary kiln units attain when high output and good heat efficiency are demanded.

"(7) A more efficient means of grinding is required than the present one in which much of the energy spent in grinding is dissipated in heat.

"These are some of the outstanding problems that face the research workers in the cement industry and will keep them busy for many years yet. Cement manufacturers who are in a position to make experiments with commercial-scale kilns and mills are better equipped than the laboratory experimenter who has available only gas or oil-fired kilns or electric furnaces and small mills of no more than batch capacity. Laboratory kilns cannot repeat the conditions occurring in coal-fired rotary kilns, nor can experimental mills of 2 ft. diameter give any other than comparison between different sets of experiments. Hence progress in the cement industry on a scientific basis will probably come as the result of full-scale experimental work by the manufacturer following indications suggested by the laboratory worker. While there is no certainty that portland cement as defined by the standard specification will continue to be the standard commodity for concrete, there can hardly be any doubt that a cement for general use will be made from the materials most readily available, viz., calcareous and argillaceous materials in their many forms of chalk, limestone, clay, shale and sand. Hence, the portland cement manufacturer is never likely to be superseded, but it may be necessary on the basis of future inventions to reorganize processes and chemical compositions."

Prizes of $175

ALL CONTRIBUTORS to this new department of ROCK PRODUCTS are automatically entered for a chance to win $100 for the best contribution; $50 for the next best, and $25 for the third best. The prizes are to be awarded by Christmas, 1930. In addition, all contributors will receive regular compensation at liberal rates for their contributions as published.

To judge these contributions the following gentlemen, all well-known experts in cement chemistry, have consented to serve: P. H. Bates, United States Bureau of Standards, Washington, D. C.; Richard K. Meade, consulting chemist, Baltimore, Md., and H. E. Brookby, consulting chemist, Chicago, Ill.—Editor.

Chemical Causes of Concrete Failure Due to Faulty Aggregates

ANALYZING the causes of failure of concrete in 400 cases, H. A. Holt, in *Cement and Cement Manufacture,* in addition to the many familiar faults such as over-sanded, over-watered mixes, etc., finds chemical action of aggregates, or impurities in aggregates, a common one. For example, 12.3% of the failures were caused by aggregates contaminated with organic matter. Excess of coal in such aggregates as breeze, clinker and sand, resulting in expansion of the concrete with cracking and disruption, accounted for 5.75% of the failures.

Instances of sulphur in the form of sulphides found in aggregates such as spur, unweathered slag, breeze and clinker, resulting in delayed hardening and disruption of the concrete on the oxidation of the sulphides caused 5% of the failures. This fault is frequently partly the result of porous concretes. Thirteen (3.25%) cases were of aggregates containing sulphur as sulphates, such as spar, breeze, clinker or slags, causing gradual cracking and disintegration.

One failure was due to an aggregate containing free lime causing blowing and disruption of the concrete.

Although organic matter, the author states, is principally found in pit sands and gravels, instances have occasionally been recorded where other aggregates, such as limestone, granites and river sands contaminated with organic matter, have caused failures. In one case the concrete of a retaining wall which after nine days had failed to show any signs of hardening was found to have been made of an aggregate consisting of broken brick.

Raw Mix Control in Cement Manufacture

By G. W. Jordan

Chief Chemist, Southern States Portland Cement Co., Rockmart, Ga.

THE METHOD of controlling the raw mix, or the proportioning of the raw materials, doubtless the most important step in the manufacture of portland cement, may be said to closely parallel our knowledge as to the composition of this product. In the earlier history of portland cement in the United States, when its manufacture was confined more or less to one locality and the magnesia specifications very stringent, it was customary to proportion the raw materials almost entirely according to their calcium carbonate content, errors due to magnesia, insoluble CaO, etc., being eliminated by comparison with a so-called "standard mix." As the manufacturing area increased different raw materials were used, the permissible maximum amount of magnesia was increased in the standard specifications, and it became necessary to provide for this increased basic content. As a result such formulas as $CaO+1.4\ MgO$ equal to various amounts of silica, ferric oxide and alumina, according as to the compounds thought to be present in the clinker, appeared in cement literature and were used as proportioning formulas by cement men.

Hydraulic Modulus Used in Mix Control

At a later date, when it was determined that magnesia does not displace lime, at least when in the proportions ordinarily found in portland cement, the so-called "hydraulic modulus" or the $\dfrac{CaO}{SiO_2+Al_2O_3+Fe_2O_3}$ ratio became the most satisfactory formula for mix control. However, when it was considered that silica, ferric oxide and alumina, all having different molecular weights, could not possibly have the same combining ratio with lime, it was apparent that this formula at its best was a purely empirical one. Recently there has come into use the "molecular ratio" in which the molecular ratio of the lime, divided by the sum of the molecular ratios of the silica, alumina, and ferric oxide content is equal to a certain constant, generally around 2.50. While this removes the objection to the "hydraulic modulus" it presupposes that at any given plant the lime-silica combining ratio will always be the same, which is true only in very exceptional eases.

As portland cement has come to be manufactured more and more from by-products of other industries with widely varying chemical compositions there has come also a demand for a better knowledge as to the exact composition of this product and a method of proportioning the raw materials that will leave nothing to chance. During the last few years much valuable research has been done on this problem, particularly by the Portland Cement Fellowship at the Bureau of Standards in Washington. Several very controversial points have been made clear and we can now say very definitely that the essential compounds in portland cement clinker are the following: tricalcium silicate ($3CaO \cdot SiO_2$), dicalcium silicate ($2CaO \cdot SiO_2$), tricalcium aluminate ($3CaO \cdot Al_2O_3$), and a compound represented by the formula $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$, with the MgO remaining uncombined. If we consider this latter formula, for the purpose of computation only, as a mixture of $3CaO \cdot Al_2O_3$ and $CaO \cdot Fe_2O_3$, then the alumina and ferric oxide will always have a definite combining ratio with the lime, only the lime-silica combining ratio being variable. Consequently, we may write the formula $CaO = (1.87-2.80)\ SiO_2+1.65\ Al_2O_3+.35\ Fe_2O_3$, which will apply to clinker burned to equilibrium and before the addition of gypsum.

The difficulty in applying this formula is, of course, in determining the correct lime-silica combining ratio or, as it has been aptly named, the "lime-silica index." We cannot arbitrarily say that this has a value of 2.33; for example, the raw materials may be of a highly siliceous nature, coarsely ground, and burned at a comparatively low temperature in which case the resulting cement would probably be unsound. Or the reverse may be true, the raw materials might contain a high percentage of fluxing material, ground to an exceptionally high fineness, and with prolonged burning at high kiln temperatures. Under such conditions a somewhat higher lime-silica index might be desired.

Clinker Appearance Good Evidence of Quality

To the layman around a cement plant the best evidence as to the quality of the product is the appearance of the clinker. Clinker which has been properly burned, and in which the raw materials have been correctly proportioned, has an appearance all of its own which readily distinguishes it from the inferior product and many a superintendent would prefer this standard of quality above any chemical analysis. Some time ago the writer was impressed by the fact that satisfactory samples of clinker had apparently widely different chemical analysis, particularly when the shale was obtained from different depths in the quarry. This led him to calculate the lime-silica index of these samples and endeavor to find what relation if any they might have to the other compounds of the clinker. Analysis of several such samples are given in Table I.

The above clinker samples when judged by their color, size, weight, texture, etc., could be classed as perfect; the resulting cement gave no evidence of free lime in the soundness test and the tensile strengths, particularly the latter half, would compare with the best of the so-called "high early strengths." Yet the chemical analyses show a wide variation and no one of the formulas ordinarily used in proportioning raw materials would apply to these collectively. The lime-silica indexes of these samples were also determined by subtracting from the total CaO content the amount of lime combining with the alumina and ferric oxide ($1.65\ Al_2O_3+.35\ Fe_2O_3$) and dividing the remainder by the amount of silica present. (For the most accurate work the free or uncombined CaO should also be determined and subtracted from the total CaO and about 80% of the insoluble residue subtracted from the amount of SiO_2 present. In the above samples, however, these corrections made no material difference in the resulting lime-silica index and have not been included in the calculations.) These results are given in Table II.

Connection Between Silica-Flux Ratio and Lime-Silica Index

If at the same time we determine the $\dfrac{SiO_2}{R_2O_3}$ ratio or, as it is sometimes called, the silica-flux ratio, we note there is a close connection between this ratio and the lime-silica index. This is made more evident by constructing the chart shown below and plotting the correct lime-silica index for different $\dfrac{SiO_2}{R_2O_3}$ values which we find approximates a straight line.

The objection to this method of propor-

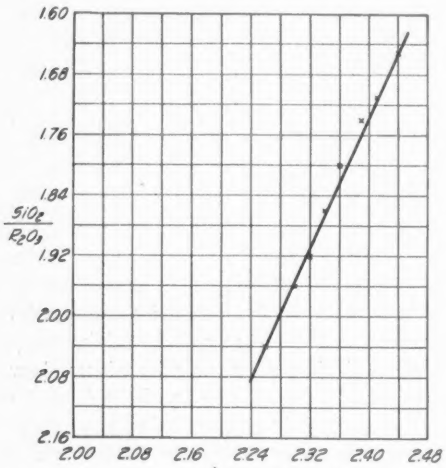
TABLE I. ANAYLSIS OF CLINKERS

	1	2	3	4	5	6	7	8
SiO_2	22.20	21.74	20.92	21.24	21.02	20.54	20.04	20.06
Al_2O_3	8.40	8.10	8.20	8.39	8.72	8.81	8.54	8.84
Fe_2O_3	2.48	2.88	3.01	3.03	2.96	2.99	3.18	3.33
CaO	64.84	64.36	63.12	64.67	65.07	64.62	63.58	64.78
MgO	1.40	2.04	3.77	2.27	1.48	2.26	3.96	2.41

TABLE II. LIME-SILICA INDEX OF CLINKERS

	1	2	3	4	5	6	7	8
Lime-silica index	2.26	2.30	2.32	2.34	2.36	2.39	2.41	2.44
$\dfrac{SiO_2}{R_2O_3}$	2.04	1.98	1.92	1.86	1.80	1.74	1.71	1.65

tioning raw materials will be that the analyses can be made only on the finished product with no opportunity for correcting existing errors in proportioning. For the hourly routine test no substitute in convenience and rapidity has been found for the well known acid-alkali test in spite of several objections to its use. If hourly samples are taken of clinker, and mix or slurry from the kiln feed, over a period of 24 hours, the average total carbonates determined for this period, preferably expressed as their lime equivalent, the clinker analyzed and the lime-silica index determined, then the car-



Lime-silica index of clinkers for different silica-flux values

bonate value found will be the correct temporary one for that lime-silica index. It might be thought that this relationship, once determined, would be a permanent one, but instead it will be found to have a considerable variation as the amount of magnesia changes and the proportions of silica, ferric oxide, and alumina vary toward each other. However, once determined, we may assume it to be correct until a new comparison may be made. For instance, the average total carbonates for a 24-hour period is 77.05, the clinker for the same period shows a 2.30 lime-silica index, also that a 2.35 value is desired. A little calculation or previous experience will show that 77.5 is the correct percentage of carbonates in the mix or slurry for the next 24 hours or until a new comparison may be made.

Essential Factors in Proportioning

From the foregoing the writer has endeavored to show that the essential factor in proportioning raw materials is not the calcium carbonate content or the total carbonates, not the "hydraulic modulus" or the "molecular ratio," but the lime-silica index, and that, *all other things being equal,* the correct value for this index will increase as the $\frac{SiO_2}{R_2O_3}$ ratio decreases. It cannot be too strongly emphasized that of equal importance to the chemical composition in determining the correct lime-silica index are the physical factors, the fineness to which the raw materials are ground, the temperature and duration of burning, and in this respect every mill is a problem in itself. However, once these factors have been standardized, with little or no variation, the changes due to the chemical composition should not be difficult to determine.

Committee Adopts New Specifications for Cement

COMMITTEE C-1 on cement of the American Society for Testing Materials has adopted, almost unanimously, the proposed new tentative specifications for high-early-strength portland cement. In connection with the proposed new tentative specifications the committee chairman, P. H. Bates, United States Bureau of Standards, reported:

"Increase in the purchase and use of the so-called high-early-strength portland cements has naturally stimulated interest in specifications for such materials. The present Standard Specifications for Portland Cement (C 9-26) do not suffice, since these high-early-strength cements must be tested at ages earlier than therein specified. Also, it is claimed that in some cases it is desirable, or even necessary, to add gypsum in amounts somewhat larger than permitted by the present specifications. Therefore, there exists the need of new specifications, and the early adoption of the proposed Tentative Specifications for High-Early-Strength Portland Cement may meet this need by providing prospective purchasers with an expression of what now appears to the committee as reasonable requirements for such cements. Moreover, immediate adoption of these tentative specifications may be the means of avoiding any considerable and undesirable increase in the number of different specifications designed by various users to apply to the purchase of high-early-strength portland cement.

Changes in Specifications

"These proposed specifications for high-early-strength portland cement are identical with the present Standard Specifications and Tests for Portland Cement (C 9-26) with the exception of the requirement for sulfuric anhydride (SO_3) content which has been made 2.5% instead of 2% and the tensile strength requirement on the average of three standard mortar briquets which has been changed to a minimum of 275 lb. per sq. in. at 1 day and 375 lb. per sq. in. at 3 days with the provision that the purchaser has the option to require a test at 28 days in which case the average tensile strength obtained shall be higher than the strength at 3 days. The sampling, chemical analysis and physical testing are to be performed in accordance with those described in the Standard Specifications (C 9).

The committee also proposes changes in the present standard specifications and tests for portland cement. The committee reports through chairman that it has under way at present quite an extensive investigation, the object of which is to develop if possible a more significant test for portland cement than the briquet test now in use. It will be some time, however, before sufficient information will have been obtained regarding the possibilities of such a method to warrant its adoption as a tentative standard. In the meantime, the committee feels that it is desirable to amend the present specifications for strength so as to bring the minimum requirements more in line with the general strength level now being maintained by American portland cements. A survey conducted by the Portland Cement Association during the last six months of 1928, the results of which have been made available to the committee, indicates that less than 7% of the cements tested failed to meet the proposed minimum requirement of 275 lb. per sq. in. at 7 days, and that only 3% failed to meet the proposed requirement of 350 lb. per sq. in. at 28 days. In view of this, it is believed that the committee is justified in recommending the proposed increase in the minimum tensile strength requirements, pending such later revisions of the method of determining strength as may be warranted by the investigations now being conducted.

A special sub-committee under the chairmanship of Thaddeus Merriman, New York City, is also studying the question of limiting the lime content in portland cement by the use of the molecular ratio of lime to silica, alumina and iron, and is expected to make a preliminary report at the next meeting of the committee.

The other proposed changes have to do with methods and apparatus for testing.

Special Attention to Masonry Cements

At a meeting of Committee C-1 on Cement, held in Detroit, Mich., March 19, in conjunction with the Spring Group Meetings, the committee gave considerable attention to masonry cements. The committee has decided that a more detailed study of masonry cements, particularly in the development of tests to determine the workability, is desirable. The personnel of the committee is accordingly being increased to include the producers of these cements.

The work of the Cement Testing Reference Laboratory recently established at the U. S. Bureau of Standards, was discussed. The discussion indicated particularly the exceptional and favorable work that is being done by the laboratories on calibrating cement testing equipment, and in giving instruction to those making the tests. At the present time, there are three inspectors traveling between the various laboratories—one inspector on the Pacific coast, and the other two in the East.

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Supplement to Rock Products, Volume

Aeroplane view of the Portland Point, N. Y., cement mill (Plant No. 7) of the Pennsylvania-Dixie Cement Corp.,

of the Pennsylvania-Dixie Cement Corp., situated on the shores of Lake Cayuga. The mill has an annual capacity

n 29, 1930

al capacity of 1,100,000 bbl.

A "Straight-Line" Designed Crushed Stone Plant

Federal Crushed Stone Corporation, Buffalo, Has a Limestone Crushing and Screening Operation Combining Simplicity and Economy in First Cost with Capacity and Low Operating Cost

THE NEW PLANT of the Federal Crushed Stone Corp. is located about seven miles east of downtown Buffalo, N. Y., along the Lehigh Valley railroad. Construction work was started on it in February, 1929, and it was put into operation June 15 last.

It consists essentially of a 42-in. gyratory primary crusher, a 10-in. "Newhouse" secondary crusher, Niagara vibrating screens for both scalping and final sizing, and concrete stave silos for loading bins. No elevators are used, all elevating and conveying being done on belt conveyors.

The plant is of simple straight-line design, scalping and recrushing being done at ground level, and only the finished sizes going to the screen house.

Dump trucks are used for transporting the rock from the quarry to the primary crusher, the maximum haul being about 1000 ft.

Eight concrete stave silos furnished by the Federal Concrete Co., Buffalo, are arranged in two rows, five in one row and three in the other, with spaces between the three for two more if required later. They are built on the solid rock and the two rows have a space between for railroad loading from either row, while truck loading is done on the outside. This arrangement of the silos utilizes three existing parallel pits which had been cut through the rock by the Lehigh Valley railroad, the former owner of the property, for coal-handling purposes. Each of these pits was some 1500 ft. long and 12 ft. wide by 14 ft. deep.

A recent type of wagon-mounted jackhammer drill at the quarry

Each of the silos is 22 ft. in diameter by 40 ft. high, and has an available capacity of about 500 tons of stone.

The screen house over the silos is of steel construction supported on steel columns from the ground level. The recrusher house and the conveyor galleries are of timber construction. Copper alloy galvanized corrugated sheets were used throughout for covering.

The plant was designed for a capacity of 300 tons per hour and is arranged for an additional secondary crusher, which was installed during the winter. All screening is done dry, although some of the sizes may be washed later if found desirable.

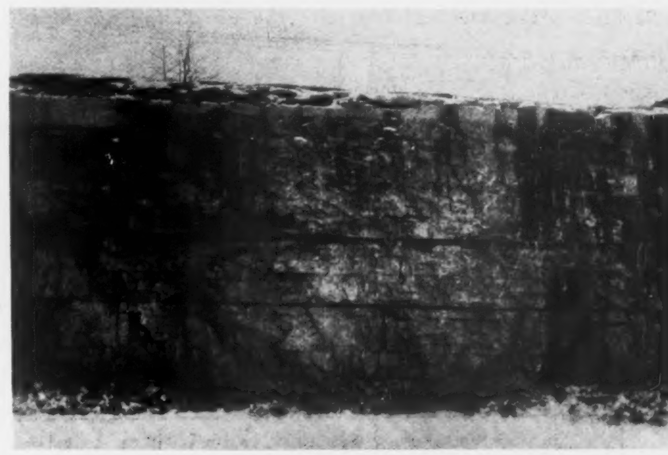
Quarrying

The property is about 100 acres in extent with about 8 to 10 ft. of over-burden. The stone is a hard gray limestone of the Onondaga foundation, which has been core-drilled and tested to a depth of 100 ft., and which is fairly well stratified.

The unusual and striking feature about the stone deposits is the smoothness of its top surface. It is literally as smooth as a floor, showing slight glacial scratches and is practically level with a slight slope toward the south. The seams are parallel with the top surface, all of which works out very nicely, as the natural drainage is to the south and away from the plant.

The quarry operation, as well as the plant, is new and a 12-ft. face was worked during the past season. Work is now under way, however, opening up an 18-ft. face below the upper 12 ft. and this will probably later be combined with the upper ledge to give a 30-ft. face.

Drilling is done with three of the latest type X-71 Ingersoll-Rand wagon mounted drills, which have shown a drilling speed of



View of the upper ledge of the quarry showing the horizontal stratification

30 ft. per hour. The holes are spaced 7 ft. apart each way. "Jackhamers" are used for any secondary drilling required. Compressed air is furnished by a 580-cu. ft. per min. two-stage Gardner-Denver compressor, driven by a F. L. Smidth short-center belt drive from a 200-hp. Crocker-Wheeler synchronous motor, which unit is located in one end of the shop building.

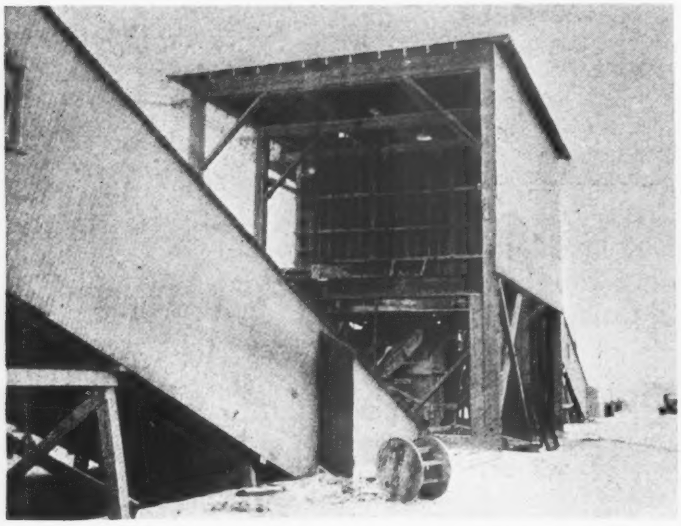
Very little pumping of water has been necessary for quarry drainage and this has been taken care of by a small gasoline-engine-driven plunger pump, but a submerged type motor-driven centrifugal pump is now installed in the new pump hole at the lower level.

The rock is loaded into the trucks by a model 91 Marion crawler-type steam shovel with a 5-yd. dipper. Two Pierce-Arrow, two Mack and one White truck are used for hauling the stone to the crusher at present.

A Marion type 460 electric crawler shovel with a 1½-yd. dipper is used for stripping and for loading in and out of the storage piles which are located on the smooth rock floor alongside the plant.

Crushing and Screening

The trucks from the quarry dump into either side of a 42-in. Allis-Chalmers "Mc-

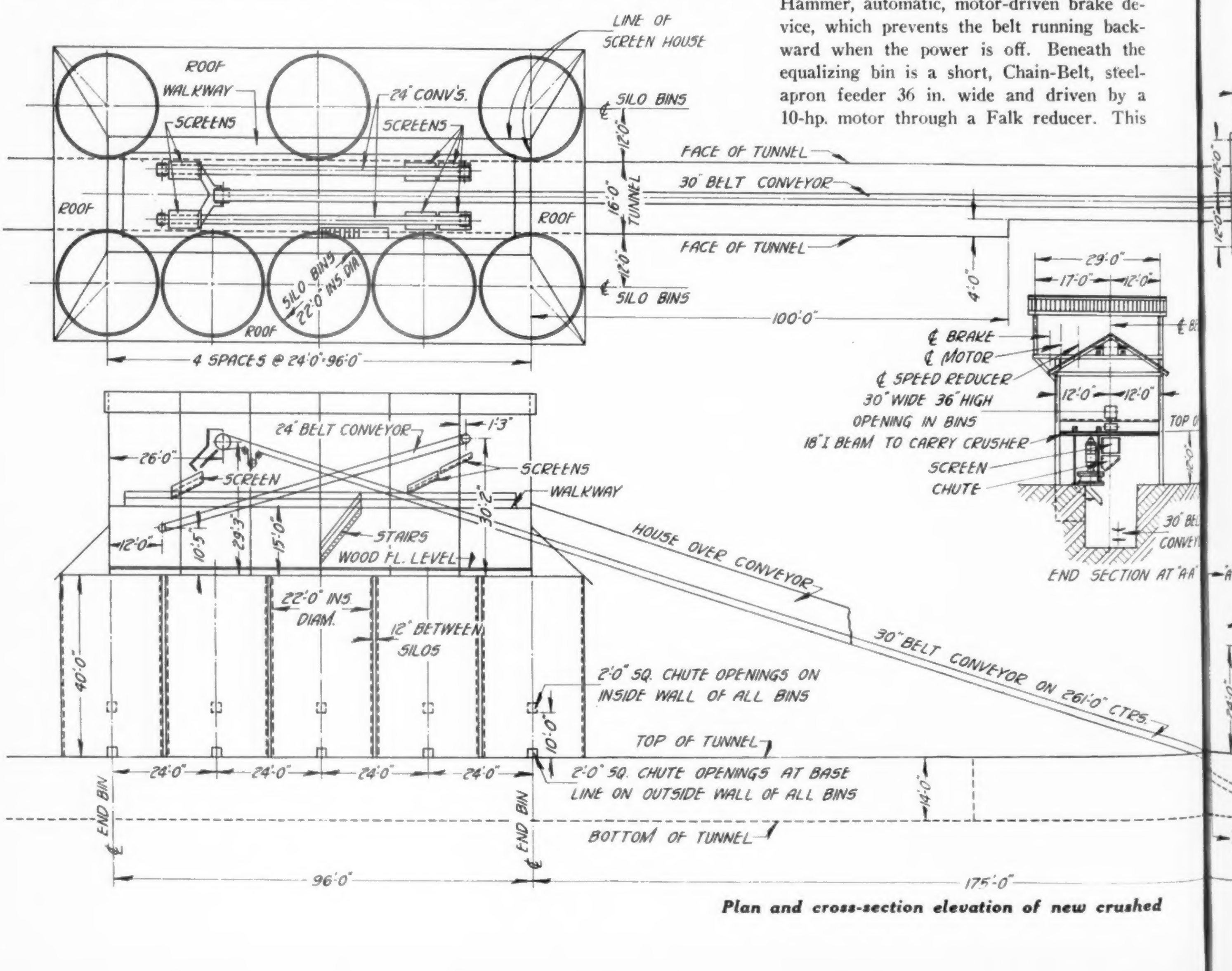


Secondary crusher building with the equalizing bin and scalping screen

Storage silos and screen house. The electric shovel is loading from ground storage

Cully" gyratory crusher, placed down in one of the old pits, so that the receiving openings are at the level of the top surface of the rock. This smooth rock surface makes an excellent roadway for the trucks to and from the crusher, equal to any concrete road. The 42-in. crusher is driven by a 200-hp. Allis-Chalmers slip-ring motor through a Texrope drive, and controlled by switches and drum controller located in a small switch house alongside the dumping point.

The crushed rock from the primary crusher is spouted on to an inclined belt conveyor 42 in. wide by 180 ft. long, which carries over and up to the recrusher building, discharging into a bin which serves to equalize the flow of stone from the primary crusher to the rest of the plant. This conveyor is driven by a 75-hp. motor through a Falk speed reducer, and has a Cutler-Hammer, automatic, motor-driven brake device, which prevents the belt running backward when the power is off. Beneath the equalizing bin is a short, Chain-Belt, steel-apron feeder 36 in. wide and driven by a 10-hp. motor through a Falk reducer. This



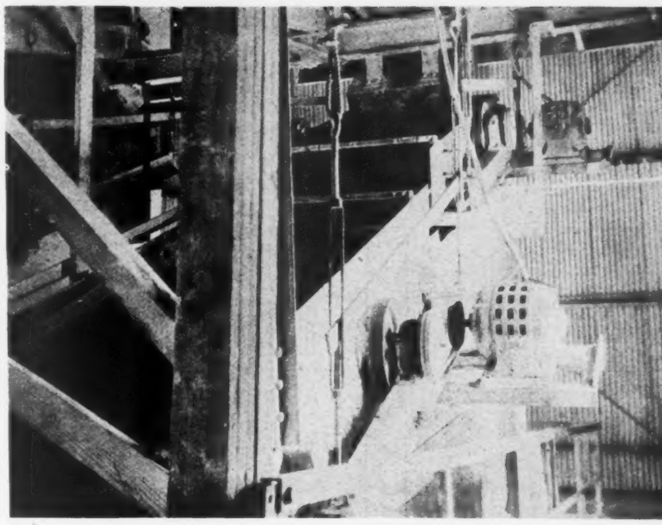
Plan and cross-section elevation of new crushed

feeds the stone from the bin to the scalping screen.

The scalping screen is a 5-ft. by 6-ft. Niagara double-deck vibrating screen, which is at present used single-deck with wire cloth of 3½-in. square openings. The oversize spouts into a 10-in. Allis-Chalmers "Newhouse" reduction crusher, and the minus 3½-in. material passing through the screen, as well as the recrusher material from the crusher, spouts into the belt conveyor carrying up to the screen house. The original recrusher is located on one side of the center line of the belt conveyor and a second crusher of the same type has recently been installed alongside the first. In conjunction with this second crusher a 24-in. return conveyor belt has been installed. This permits the recrushing of any size in the bins not being shipped and makes the plant more flexible, particularly with increasing demand for smaller size stone.

The lower deck of the Niagara scalping screen will be equipped with 1½-in. mesh wire cloth so that No. 3 and No. 4 material passing over this deck may be spouted to the second crusher for recrushing. This lower deck can of course be easily removed if it is desired to put No. 3 and No. 4 sizes into the bins, or other sizes of wire cloth may be used to get whatever reduction is desired. In either case, all the material at this point is spouted on to the main conveyor up to the screen house.

One of the pits above referred to was utilized not only for the crusher location but for the lower run of each of the two conveyors, thus saving the cost of these excavations.



One of the two sets of two 48 in. by 8 ft. vibrating screens, in tandem, for taking out smaller sizes of stone

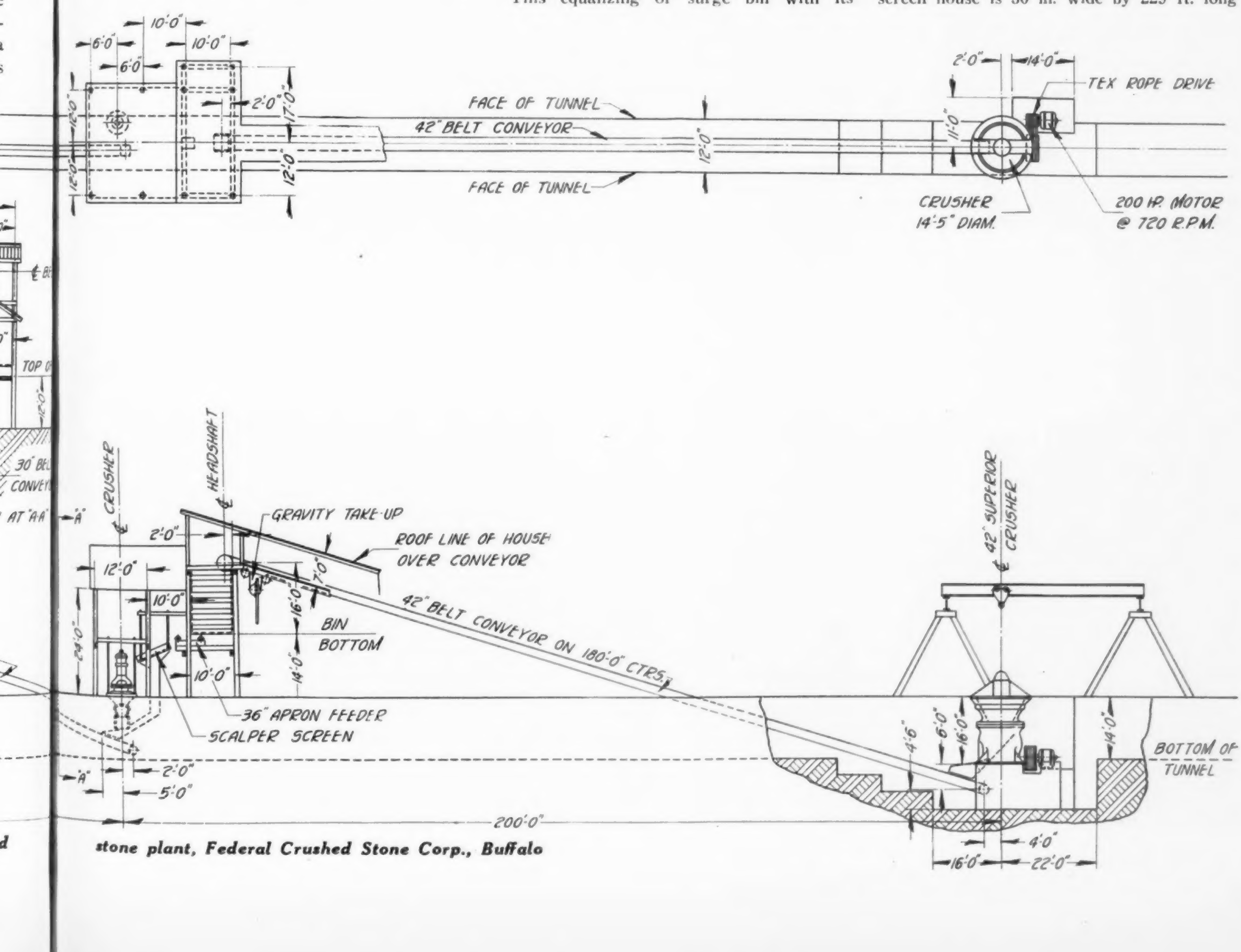
Safety Feeding Device

The equalizing bin over the scalping and recrushing equipment has a novel feature in the way of a hinged steel plate or vane under the head pulley of the 42-in. conveyor so arranged and connected up that it will automatically signal the operator at the primary crusher should the stone fill up in this bin above a certain level, thus warning him to stop dumping into the primary crusher until more stone has been drawn out of the bin.

This equalizing or surge bin with its feeder between the primary crusher and the rest of the plant is an excellent feature, giving a greater output with cleaner sizing and smoother operation.

The apron feeder is controlled by push-button switch alongside the secondary crusher, and is easily started and stopped at will.

The belt conveyor carrying up to the screen house is 30 in. wide by 225 ft. long

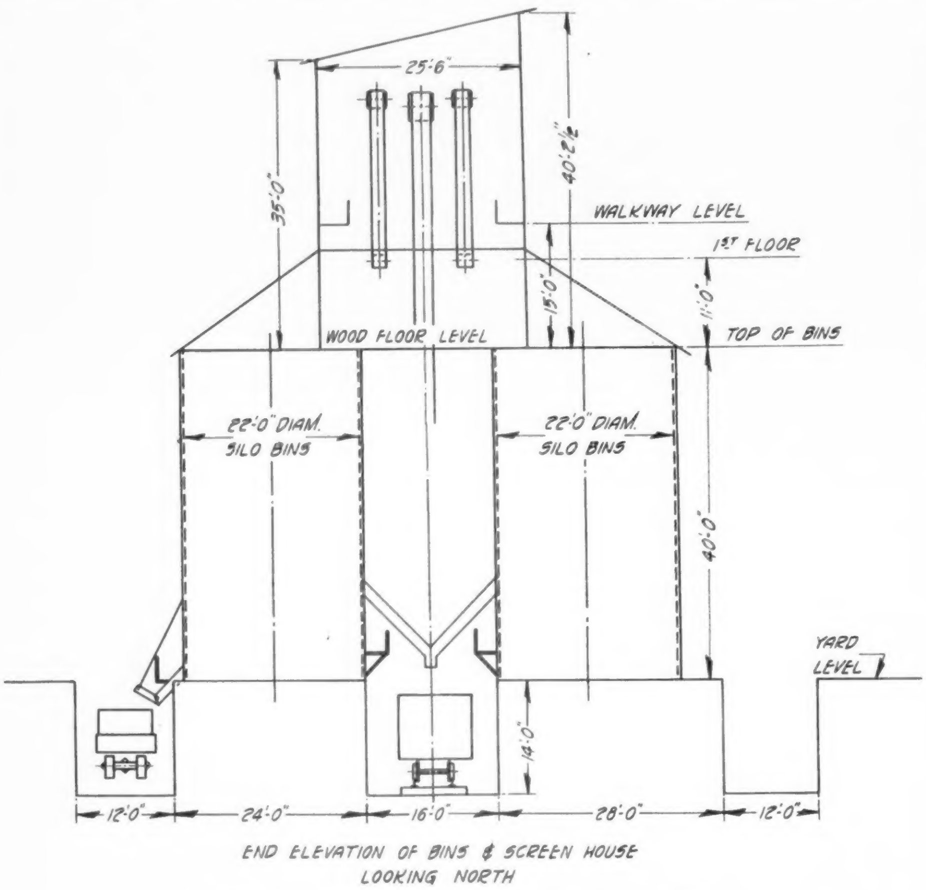


stone plant, Federal Crushed Stone Corp., Buffalo

on a slope of about 20 deg. It is driven at the head end by a 50-hp. motor through a Falk reducer, and has a brake arrangement to prevent reversal. The conveyor as well as the six vibrating screens and the two return belt conveyors in the screen house, are all controlled by push-buttons located at one point in the screen house.

Duplicate Screening System

The stone entering the screen house on the main belt conveyor is divided equally to two parallel sets of screens and conveyors arranged as follows: It spouts first on to two parallel 4-ft. by 8-ft. Niagara double-deck vibrating screens with 2¾-in. openings on the top decks and 1½-in. openings on the bottom decks. The No. 4 size passing over the top decks, and the No. 3 size passing over the bottom decks, spout to the respective bins. The minus 1½-in. sizes passing through the bottom decks are returned on two parallel inclined belt conveyors to two sets of two 4-ft. by 8-ft. Niagara screens in tandem. The upper screens are single-deck with ⅜-in. mesh wire cloth which removes the No. 0 or minus ⅜-in. size. The material passing over these two screens drops on to the lower two screens which are double-deck with ⅝-in. mesh cloth on the top decks and ⅜-in. mesh on the bottom decks.



End elevation of storage bins and screen house

The No. 2 size passing over the top decks spouts to the bins, as does also the No. 1 size over the bottom decks. Any minus ⅜-in. material not taken out by the upper screens spouts to the No. 0 bin.

Each of these six Niagara screens, as well as the scalping screen, is driven by a 5-hp. Fairbank-Morse ball-bearing motor through a Texrope drive, and is started and stopped by push-button control.

The two inclined return belt conveyors in the screen house are each 24 in. wide by about 70 ft. long and are driven by 10-hp. motors through Falk reducers.

The two main belt conveyors, as well as the two return conveyors, are Rex-Stearns, with roller-bearing troughing idlers and lagged head pulleys.

Allis-Chalmers motors are used throughout except as noted otherwise.

The screening plant is quite flexible, as the screen sizes may be easily and quickly changed to permit of making more than the five sizes mentioned. The spouts from the screens are also arranged for mixing the various sizes or putting them into different bins, as desired.

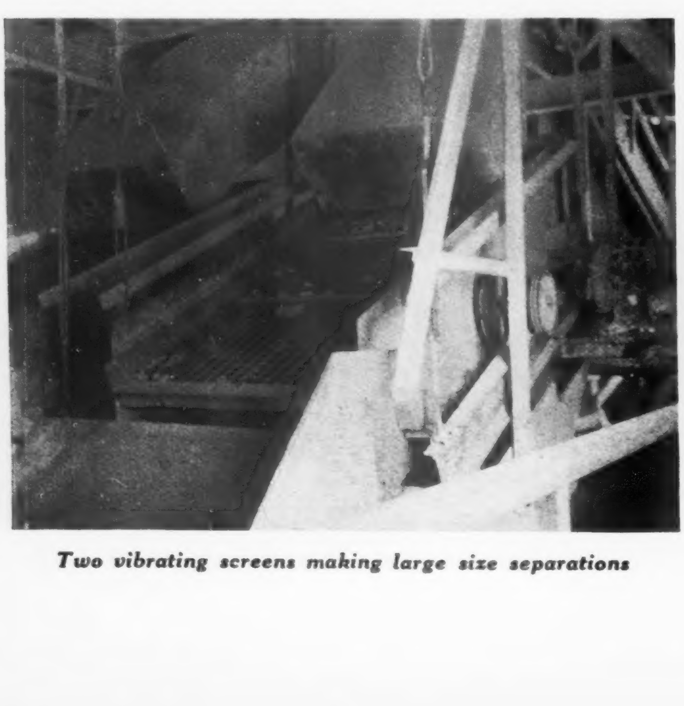
General

An electric siren system is used for signaling between the screen house and the balance of the plant, and in addition stop buttons are located for emergency use.

Water supply is from a deep well on the property, pumped to a 150,000 gal. capacity steel storage tank. This tank is connected by a 6-in. line with a 250-g.p.m. Buffalo centrifugal pump, direct-connected to a 40-hp. General Electric motor, which unit is separately housed and supplies water for the shovels and for fire protection.

Electric power is 3-phase, 25-cycle, which comes in at 11,000 volts and is transformed down to 440 volts at the plant.

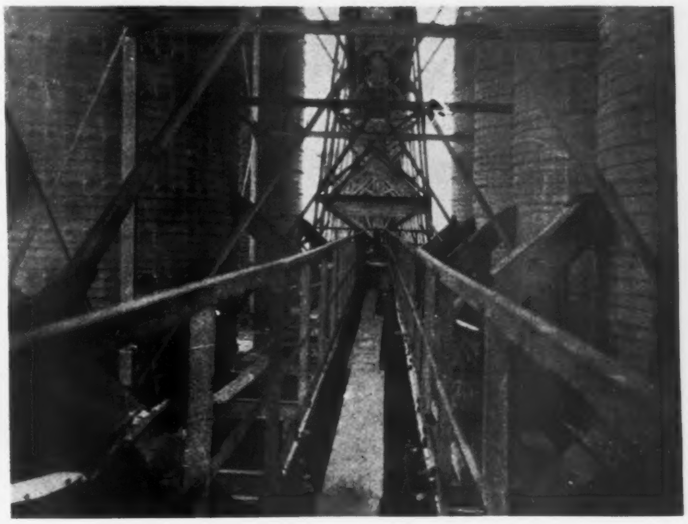
The repair shop is a Blaw-Knox standard



Two vibrating screens making large size separations

Rear of the screens showing the spout arrangement

End view of the storage silos, showing also how the old pits have been utilized



Looking between the storage silos; the runway is over the loading tracks

sectional steel building, and contains a Gardner-Denver power drill sharpener and oil heating furnace in addition to the usual equipment.

A 25-ton Plymouth gasoline locomotive is used for switching railroad cars between the sidings and the loading bins.

The trucks handling stone are weighed on a Fairbanks "Springless" dial type scale at the plant office. About half of the shipments are by truck, and the product is used principally for concrete aggregate and road work.

Storage piles of the various sizes are maintained, aggregating about 30,000 to 40,000 tons total.

The plant is operated with a total crew of about 30 men.

The offices of the company are at 866 Ellicott Square, Buffalo, N. Y. H. N. Snyder is president and Hugh M. McNabb is secretary-treasurer and plant manager. The plant was designed and constructed under the supervision and according to the ideas of Mr. McNabb and H. E. Rainer, chief engineer. All construction details, machinery setting, etc., were in the hands of Gordon Warburton.

Aggregates for Low Cost Roads

LOW cost roads are attracting a great deal of attention now that so many main arterial highways are completed and feeders must be built. A recent issue of *Public Roads* is devoted entirely to the bituminous surfacing of such roads. The examples studied were in Florida and South Carolina. In Florida such roads have been intensively studied because aggregates for more expensive types must be freighted in from a considerable distance.

The base for such roads usually consists of a sand, clay or dirt road that has been compacted by travel and the weather. It has to be smoothed and shaped and if the surface does not have a sufficiency of coarser particles it must be stabilized by pea gravel. In one case, fine washed gravel, all passing ¾-in. and 40% retained on ¼-in. was used at the rate of 100 tons per mile. Three months later the road was carefully swept and all loose material removed and then a road oil was applied at the rate of 0.4 gal. per sq. yd. and immediately covered with crushed slag, all passing 1-in. and retained on a 20-mesh, with 25 to 75% passing ½-in. This was applied at the rate of 40 lb. per sq. yd. The road was thoroughly rolled before being opened to traffic. The cost, including the pea gravel course, was $2,560 per mile and maintenance the first year $67.92 per mile, with a daily traffic density of 990 vehicles. Later costs have been much lower, about $1.78 per mile per month. On other roads given the same treatment the pea-gravel course could be omitted and the cost per mile was from $800 to $1000 less, the maintenance cost being about the same.

Crushed granite was used on a South Carolina road, 1¼ in. to ¼ in. in size spread 54 lb. to the sq. yd. The cost was $2,324 per mile with labor and asphaltic material. Later a seal coat was applied but this "bled" badly in hot weather and had to be covered with sand. As this formed a slippery surface, it was covered with limestone screenings producing a much more satisfactory surface. This made an expensive road as compared with the others mentioned. But another road was given 50 lb. per sq. yd. of crushed granite with oil, the cost complete being $2,628 per mile. Later this was given a seal coat of ¾-in. to ¼-in. crushed granite which cost $600 per mile. Maintenance costs have been running $12.50 per mile per month, including shoulder maintenance, the density being 1,220 vehicles per day.

The condition of the subsoil is considered very important and has much to do with the cost of maintenance. Special attention should be given to patching and properly made patches, it is said, can hardly be detected. Crushed material is much preferable to rounded pebbles as aggregate, and relatively coarse material should be used as a top course to impart non-skid properties. Sand is considered unsuitable for covering.

Trucks are loaded from ground storage by a 1 1/2-cu. yd. electric shovel

Review of Recent Sand and Gravel Research

Annual Report of Stanton Walker to National Sand and Gravel Association Summarized and Commented on

By Edmund Shaw
Contributing Editor, Rock Products

THE Fourth Annual Report of the Engineering and Research Division of the National Sand and Gravel Association is a mimeographed book of about 100 pages, fully half of which contain tables and diagrams giving the results of tests made in the association's laboratory. Abstracts and notes of these have appeared in ROCK PRODUCTS from time to time during the year, but the full report in its size and the completeness with which the test results have been analyzed and presented to the reader will surprise even those who keep fully abreast of such developments. It is a valuable contribution to the literature of aggregate research and one that has noticeably advanced our knowledge of the subject. It was submitted to the association at its annual convention at Memphis, and its author, Stanton Walker, director of engineering and research for the association, submitted with it a paper on characteristics of aggregates which properly supplements it, but which is reviewed separately.

The report lists the laboratory work of the year 1929 as studies on the following subjects:

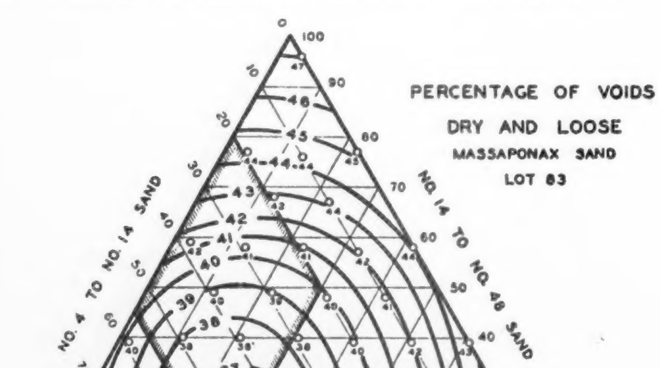
1. Effect of grading on void content of sand and gravel and the consequent effect on strength and economy of concrete.
2. Effect of the addition of finer sizes, such as pea gravel, to coarse aggregate on the strength and economy of concrete.
3. Studies of gravel ballast.
4. Effect of variations in maximum size of coarse aggregate on the strength of concrete.
5. Effect of variations in the grading of sand and gravel, within specification limits, on its concrete-making proportions.
6. Effect of flat particles on concrete-making properties of gravel.
7. Studies of methods of measuring the quality of gravel particles.
8. Studies of effect of mineral composition and shape of particles of aggregates on their concrete-making properties.

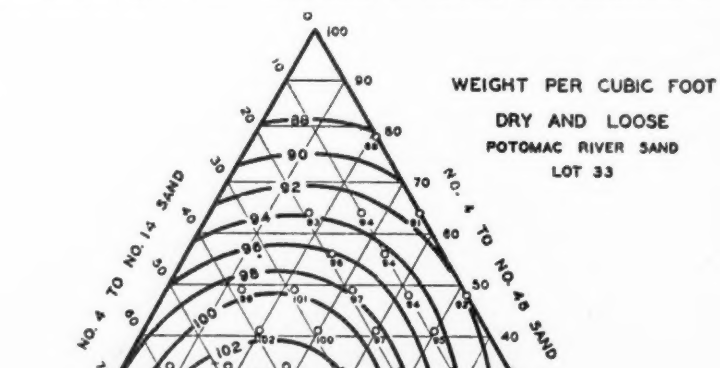
Gradation and Voids

The study of the relation of gradation to voids has been before the public in an abbreviated form for some time. The graphs in it, taken with those given in Goldbeck's report to the National Crushed Stone Association (see ROCK PRODUCTS, February 2, 1929) and the tables of voids and gradation for crushed slag, given in an article by W. S. Smyers in *Concrete* for April, 1929, give us all the basic information that is needed to have a clear idea of the relation of voids to gradation for the three most used aggregates. It is interesting to compare the crushed stone and gravel triaxial diagrams and note the differences due to type. The principal difference is (as is well enough known) that crushed stone has higher voids than gravel (uncrushed) for all gradings; but a second difference, which strikes one as soon as the graphs are placed side by side, is the irregularity of the contours of equal void contents in the stone graphs and the smoothness and regularity of these contours in the gravel graphs. Both differences are presumably due to differences of shape and surface characteristics, the smooth gravel particles slipping into the position of lowest void content more easily than the stone particles. And the shapes of crushed-stone particles with concave surfaces and much angularity give higher voids even than would be possible with uniform shapes and size, spheres of the same diameter, for example.

After studying these graphs it is easy to see why crushed stone and crushed slag should have a greater proportion of sand for equal workability, as the publications of the U. S. Bureau of Public Roads and the National Crushed Stone Association have repeatedly pointed out.

The gradation-voids relation for two sands are given in Walker's report and these are interesting as showing such differences as





Grading-voids relation of two sands, showing the differences which may occur in either fine or coarse aggregates of the same type

may occur in either fine or coarse aggregates of the same type. Potomac River sand is shown to have a wider range of voids, from 46% to 33% loose, or from 40% to 29% rodded, than Massaponax sand with a range from 47% to 36% loose and from 41% to 31% rodded. The Massaponax sand graph shows an area, which including the usual sand specifications, has void contents running from 44% to 36% loose and from 39% to 32% rodded. Such sands have no grains coarser than No. 4 mesh. It seems worth while to add here that where tolerances of 5% to 10% of No. 4 to 3/8-in. grains are allowed by specifications a sand which has 4% to 5% lower voids and hence a better mortar yield with perhaps a higher strength can be made by including some of the coarser grains.

The report is careful to point out that the gradation which gives the lowest voids (in all cases about 40% of the finest and 60% of the coarsest size) does not necessarily give the greatest strength, although it will give the greatest yield. As Walker points out in his paper, the best gradation is always that which gives the lowest voids in the concrete, not in the aggregate. In discussing this he points out that the addition of pea gravel (No. 4 to 3/8-in. up) up to 30% gives a decrease of voids but not an increase in strength in every case, and in the report on the effect of gradation, given farther on in this report, there are several examples of lower strength with lower voids.

Effect of Adding Fine Gravel

Economically the increase in yield may pay for a decrease in strength, and this balancing of strength against yield is the basis of the tests on the addition of pea gravel and No. 4 to No. 8 sizes to mixtures of sand and gravel, which is from 3/8-in. to 1½-in. in size. The economy is one in which the public as well as the producer is interested; for, as the report points out, the inclusion of pea gravel that now has to be thrown away would not only lower the cost of production but would conserve the natural supply of gravel that is being rapidly depleted in some localities.

TABLE SHOWING EFFECT OF ADDING NO. 4 to 3/8-IN. PARTICLES TO 3/8- TO 1½-IN. GRAVEL

Per cent No.4 to 3/8-in. size	Water ratio	Cement, sacks per cu. yd. of concrete	Strength, lb./sq. in. Comp.	Transverse
		1-2-4 Mix		
0	.81	5.16	3020	525
10	.86	5.07	2620	510
20	.88	5.01	2690	520
30	.89	5.03	2810	495
		1-2½-3½ Mix		
0	.90	5.06	2650	500
10	.92	5.02	2780	475
20	.95	4.96	2690	480
30	.95	4.97	2550	465

Mixes from 1-1½-4½ to 1-3-6 with varying additions of fine material were tried. The first had too little sand for good workability so the results should be ignored. But the tests of 1-2-4, 1-2½-3½ and 1-3-3 mixes had not this fault and the cement contents are those used in ordinary work, from 4 to 5 sacks to the yard. The tables of these tests show very plainly that the addition of pea gravel to these particular mixes showed in every mix a decrease in cement content, due to lower voids, but an increased water-cement ratio, due to the increase in surface to be covered by the cement paste, and consequently a somewhat lower strength which, however, may be offset by a greater yield.

The complete tables showing the effect of adding No. 4 to No. 8 particles and 3/8-in. to No. 4 particles are very interesting and contain a good deal of interest to the student of concrete, but they are too long to reproduce here. Table No. 5 of the report shows in a simple way the effect of adding 3/8-in. to No. 4 material up to 30% and it is noticeable that the loss in strength is less than 10%. Economically this is partly compensated for by a lower cement factor. It would seem that in localities where pea gravel is abundant that engineers might safely allow considerable proportions of it in specifications for ordinary work, saving in the cost of both aggregate and cement.

The sand in these tests had a fineness modulus of 3.07 and contained 2% of 3/8-in. to No. 4 grains. One may suppose that with a finer sand the strength reduction would be even less than it was in these tests. Gradation seems important in working with these fine materials. It may be remembered that the "sand-gravel" made at Omaha and Topeka, containing almost nothing that is coarser than ½-in., gives results that compare favorably with coarser aggregates, but this is because the gradation is carefully watched in the manufacturing process.

Studies of Gravel Ballast

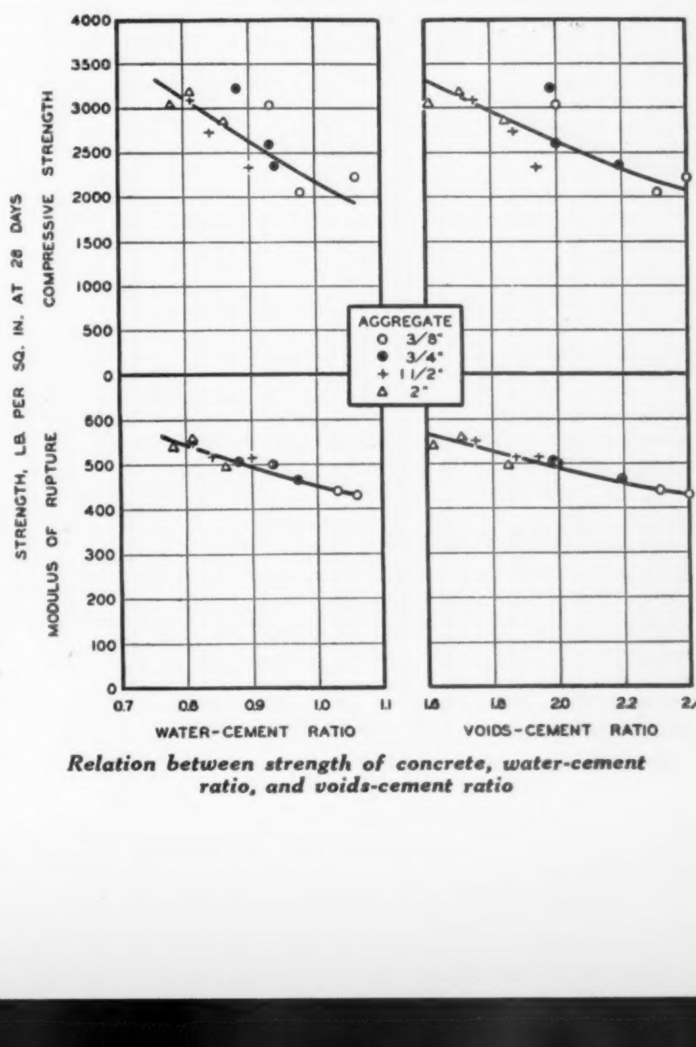
The short report on studies of gravel ballast must be considered as preliminary to a more important report on actual service results, data for which the report says are now being collected. The advantage of the brief report is that it gives a clear mental picture of what gravels are now being used as ballast. And one must suppose that such use is satisfactory as the 16 plants that furnished samples are regularly furnishing ballast in large amounts to the railways.

The gravels were tested by the standard Deval abrasion test (A. S. T. M. D. 289-28 T.), the gravel being given the "B" grading. The crushing test used is one that has not yet been standardized. It consists in crushing a 3000 g. sample of the gravel in a cast-iron cylinder 6 in. in diameter and 6 in. deep. This is put into the testing machine, a loose-fitting piston is placed on the gravel and pressure is applied at the rate of 100 lb. per second up to 3000 lb. The reduction in fineness modulus and in the percentage of voids is recorded. (More of this report was published in ROCK PRODUCTS, March 15, 1930, in the report of the convention of the American Railway Engineering Association.)

In discussing H. F. Kriege's paper on ballast at the 1929 American Society for Testing Materials meeting, Walker said:

"In the case of the tests for voids and resistance to movement, it seems reasonable to suppose that the data will be of assistance in evaluating the effect of grading on stability, drainage and perhaps other properties. Probably the lowest void content consistent with proper drainage will furnish a ballast of the greatest stability feasible to use in practice. It is hoped that the tests on friction or stability will help to develop this point," which shows the practical value of making the tests in this way.

Studies of ballast have not often been reported. One reason may be that economical conditions govern the choice of material so that a discussion of qualities has no more than an academic interest. Kriege's paper referred to is one of the few that makes comparisons, and in it washed gravel stands between crushed stone and slag, and the differences are not great. The replacement percentages are limestones, 4.6%; gravel, 5.9%, and slag, 7.9%.



Relation between strength of concrete, water-cement ratio, and voids-cement ratio

Effect of Maximum Size

The report on the effect of size of aggregates on the strength of concrete was made by C. E. Proudley, testing engineer, National Sand and Gravel Association. It has more *general* interest than some of the others because it is a part of that research into fundamentals which Walker's report says elsewhere is so much needed. The tabulated results were given in the January 4 (Annual Review) number of ROCK PRODUCTS, so they are omitted here. But some of the graphs, redrawn to condense them, are reproduced to illustrate what follows.

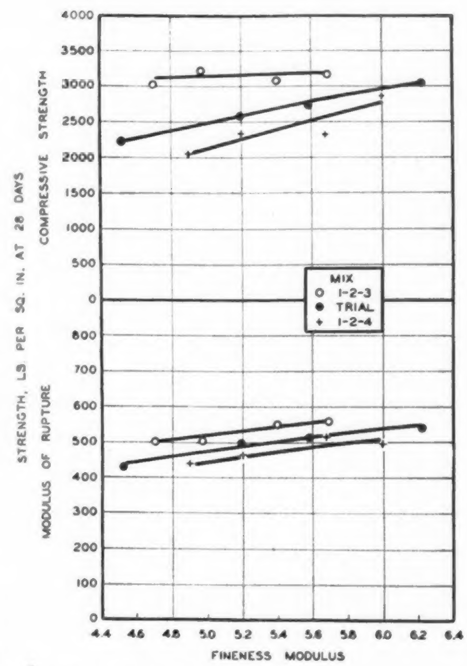
This is the first series of the National Sand and Gravel Association laboratory's tests in which trial mixes have been used, these being mixes made by trial to the same workability as judged by the operator. One may fairly suppose that this is at least as good a method as that of considering workability to be equivalent to consistency as measured by the flow table, especially in tests like these where such large changes in size are involved. However, there seems to be nothing shown in the results of these trial mixes that is not shown by the others.

In all mixes, as the graphs show, the water-cement ratio and the strength have a practically straight-line relation to the fineness modulus, which of course is increased as the maximum size is increased. Given the first result of any mix, the others might be plotted on a graph from the fineness modulus with a fair degree of accuracy. It is noticeable that the effect of increasing maximum size is somewhat less with rich mixes than with lean mixes, which does not agree with Abrams' curves, but the difference is too small to use as a basis for generalizing, and on the whole the results are what one with a knowledge of the theoretical relations of good strength to size would expect them to be with a well graded aggregate.

Proudley's introduction to his paper says that "it is believed that the report of certain researches . . . have tended to overemphasize the beneficial effect of using larger sizes of coarse aggregate," which is probably true. But such over-emphasis seems to have come from mistaking the effect of other characteristics for the effect of size or failing to consider other factors which contribute to strength. And these tests have done a great service in calling attention to the fact that the laws governing the relation of aggregate characteristics to strength are as valid now as when they were first discovered.

Effect of Gradation

Proudley is also the author of the report on the effect of gradation, which is another research into the fundamentals of concrete physics. It is very completely reported and the reviewer has gained a lot from its study. There is one lack, however, to which I would call attention, and that is the omission of gradation curves. Since gradation



Effect of grading of aggregate as measured by fineness modulus in strength of concrete

was the characteristic to be tested, it would be useful to have the gradations given so they could be compared with one another and with an ideal curve. Such comparison with an ideal, even though it were an ideal not universally accepted, would be illuminating in understanding just what the effect of gradation was in these tests.

However, it is frankly stated in the report that the principal reason for making these tests was to see whether the usual specifications governing the gradation of coarse and fine aggregates offer too wide a latitude of gradation, and the conclusion is reached that they do not. The differences in grading are even greater than one would expect to find in purchasing ordinary plant material, but the variations in strength are small. The results of this series have already been published in ROCK PRODUCTS, in Walker's review in the January 4 issue, but a more significant table is given in the full report as it affords a direct and easy comparison.

Strength Ranges in Combinations of Gradings

This table, reproduced here, shows that taking the strength of the combination of coarse sand and coarse gravel as 100% the strengths range from 90 to 108%, and that the greater number are around 100%. In other words, any combinations of gradings of gravel that would fall in the limits of the ordinary specification would give within 10% of the strength that might be expected with the ordinary mixes and water contents. The limits of coarseness and fineness chosen were those set up by the American Society for Testing Materials' tentative specifications for aggregates, and these are probably as wide as any in common use.

TABLE SHOWING EFFECT OF GRADING OF SAND ON STRENGTH OF CONCRETE AS AFFECTED BY DIFFERENT PROPORTIONS AND GRADING OF GRAVEL

	Strength ratios, per cent					
	Average all gravel			Average all mixes — Gravel		
Sand	1-2-3	1-2-4	Trial	Coarse	Medium	Fine
	Compression Tests					
Coarse	100	100	100	100	100	100
Medium	108	100	108	106	102	107
Fine	96	90	113	94	96	109
	Transverse Tests					
Coarse	100	100	100	100	100	100
Medium	104	105	103	100	106	106
Fine	100	100	108	100	103	106

(Strength ratios are based on strengths obtained with coarse sand.)

There have been two other test series recently published in which the relation of gradation to strength was studied. One was Goldbeck's series, made at the National Crushed Stone Association's laboratory, reported in full in the *Crushed Stone Journal* for April, 1929, and in abstract in ROCK PRODUCTS, August 17, 1929. The other was the well known tests on coarse aggregates made by the U. S. Bureau of Public Roads, reported in *Public Roads* for June, 1929, and in ROCK PRODUCTS, July 6, 1929. It is interesting to compare these with the tests in this report.

Coarse Aggregate Grading

In Goldbeck's tests the gradations vary considerably, so much so that they extend over a large area in the triaxial diagram given in his paper. But it will be noted that: (1) The maximum size is constant for all gradations; (2) the percentage of voids varies only 2.4% and (3) that the fineness modulus varies only from 5.36 to 5.78. The water-cement ratios vary from 0.63 to 0.68, the compressive strengths from 3910 to 4300 lb. and the moduli of rupture from 701 to 763 lb. Most of the strength results are very close to the average.

The conclusion which may be drawn from these results is that the gradation of the coarse aggregate does not seriously affect the strength of concrete so long as the changes in gradation do not affect the percentage of voids and the fineness modulus very much.

The same conclusion may be drawn from the U. S. Bureau of Public Roads tests. In these the maximum size was not constant but the variations in the percentage of voids was not more than 2% in any case. While the conclusions of Kellerman's report on these tests was that there was no consistent variation in strength due to variations in gradation, there was considerably more variation with some types of aggregates than was shown in Goldbeck's tests. The reviewer's study of the Bureau of Public Roads tests has indicated to him that the gradation was such that the fineness modulus was carried beyond the "break" in some instances by the changes in gradation, while in others it was not, and that this would account for such changes as are reported.

In the tests now being reviewed, it is noted (1) that the maximum size was not constant; (2) the percentage of voids in the *combined* aggregate varied from 20.6% to

27.2% and the fineness modulus from 6.03 to 5.00. The variations in grading therefore affected the other characteristics of the combined aggregates considerably more than in the tests mentioned.

And the effects that may be traced to grading are really more than can be expressed by the statement that the strengths vary within 10% of the average. As is noted in the report, the tables show that the strength-fineness modulus relation is true in only the most general way. Even the strength-water-cement ratio is affected to a considerable degree. It seems fair to lay these changes from the regular relationship to changes in the gradation. If this is not so it contradicts entirely such conclusions as might be drawn from the tests on the effect of sizes.

The report points out that the gradations giving the lowest voids did not give the greatest strengths and notes that it is at variance with the popular opinion. It has, however, been pointed out by other investigators, Abrams for one. It is a matter that does not often interest the producer, who is more apt to be striving to reduce the percentage of voids to meet a specification of the demand of the engineer in charge of a job. But it is well to remember that it is possible to reduce the voids to a point where the strength is lowered and to consider voids only in relation to other characteristics. In the tests on the effect in size, the strengths increase as the voids decrease in a particularly straight-line relation, but in the tests on gradation they do not.

The yield was not considered in these tests, but it would have increased as the voids decreased and this might have meant an economy that would make up for a slight loss in strength due to gradation.

Use of Trial Mixtures Increasing

There is another interest that attaches itself to the trial mixtures used in this series of tests, because designing by trial mixtures has grown in favor in the past few years. It is the only method recommended in the handbook for general distribution issued by the Portland Cement Association, "The Design and Control of Concrete Mixtures" (third edition). Hence it interested the reviewer to compare the results of the trial mixtures of these tests with the strengths read from the water-cement ratio-strength curve given in he handbook. The readings were checked by the tables given in Prof. Gilkey's paper delivered at the 1929 American Concrete Institute meeting.

The results of this comparison are given in the table below:

ACTUAL AND INDICATED STRENGTHS OF TRIAL MIXTURES

	Gravel											
	Coarse			Medium			Fine			Average		
Sand	W/C	Strengths		W/C	Strengths		W/C	Strengths		W/C	Strengths	
		Act.	Ind.		Act.	Ind.		Act.	Ind.		Act.	Ind.
Coarse	0.82	2785	2800	0.85	2545	2700	0.87	2710	2550	0.85	2680	2700
Medium	0.82	3060	2800	0.84	2725	2750	0.86	2930	2650	0.84	2905	2750
Fine	0.81	2840	2900	0.84	2980	2750	0.87	3205	2550	0.84	3010	2750
Average	0.82	2895	2800	0.84	2750	2750	0.87	2950	2550	0.84	2865	2750

This table appears to confirm the results of other investigators in showing that concrete may be satisfactorily designed by the trial method and the water-cement ratio, even where the aggregates vary considerably in gradation, as they might in making shipments from plant to job. Of course such tests were made with great care, but the details are all given in the handbook referred to and such papers as that of Prof. Robb, given in the A. C. I. *Proceedings* for 1929, and may be followed by any engineer.

The practical importance of this to the producer is in the knowledge of his product that it gives him. He can assure his customers confidently that his product will give such results, provided that it falls within the limits of the gradations given and provided that it is used with the water-cement ratios used in this series.

Other Conclusions

In the body of the report there are some conclusions that seem worth discussing here. One is:

"Comparison among different types of aggregates, which have been carried out recently, furnish examples of the inconclusive information which is obtained by endeavoring to find the final answer without first developing fundamentals. Comparisons of miscellaneous gravels and crushed stones will lead to nothing but differences of opinion and result in no good to the industry. On the other hand, studies of the influence of various aggregate characteristics, without regard to aggregate type, should provide information of a conclusive nature."

This is a fair way to look at the matter and ROCK PRODUCTS has said much the same thing editorially. At the same time, even though it is not wholly conclusive, much has been gained from such comparisons as are mentioned. Our information regarding aggregates has been greatly added to by them. And if, as seems to be the case, we cannot have real research in the characteristics of aggregates, testing only one variable at a time, and that as thoroughly as possible, it is to be hoped that the comparative tests will be continued, for something of value to the industry comes from all of them.

Another conclusion is that, on the whole, fine aggregate is more important than coarse aggregate in determining the qualities of concrete. While no evidence is offered, this is in line with the conclusions of Gonnerman in his A. S. T. M. paper and the foreign authorities quoted by him. The experiments of H. F. Kriege reported in ROCK PRODUCTS, December 24, 1928, tended to confirm this. It will be a good thing to have the importance of fine aggregate appreciated and to have it given fuller study instead of so much study on *types* of aggregates.

As to the conclusion of the report regarding the effect of mineralogical composition, mortar content and so on, drawn from an analysis of the U. S. Bureau of Public Roads tests, these were published and commented upon in the December 11, 1929, issue of ROCK PRODUCTS.

Faults in Bituminous Roads and the Part of Aggregates

B. E. GRAY, division engineer of the State Road Commission of West Virginia, told the 1929 Asphalt Conference at West Baden, Ind., that "there is a wide variation in the quality of bituminous pavements in the United States and some of them are nothing short of disgraceful." He lays this to faulty construction methods and describes methods which have given satisfactory results in his own state.

Crushed stone has been found better than knapped stone, he says, and it is better to lay the base course first and open it to traffic after treating with two applications of asphalt. Extreme care must be taken to place the base course to a uniform depth on a sub-grade that has been thoroughly rolled with all weak and soft places stabilized with crushed material. Every care should be taken to see that the base course is thoroughly filled with stone screening and dust so that there can be no movement. The base coarse should be laid up in layers.

The use of the "grade rater," a machine which records variations from the grade, is considered essential, all variations beyond the specified tolerance being corrected by patching with the use of the minimum amount of asphalt. The paper says it is *essential* that the base course conform exactly to the desired cross-section and profile if the final surface is to remain smooth.

The same care must be used with the top courses, using uniform material with the densest possible grading and checking for irregularities before applying the seal coat. These is a tendency to use too much bituminous material, which should be avoided or corrugations will result. The grade rater should be used and variations corrected.

The seal coat is ¼- to ⅜-gal. cold liquid asphalt with all the ¾-in. chips it will take. To overcome the difficulty of spreading chips from stockpiles uniformly a new machine has been devised.

Tests with a roughmeter have been made on roads constructed by this method and show an index of 50 to 60 for crushed stone base and 55 to 65 for knapped stone base. The usual index for macadam roads of a good riding surface is from 100 to 150. Car speeds on one 10-mile stretch have run as high as 60 to 80 m.p.h. Such roads have been built at costs from $5000 to $20,000 per mile, according to the paper.

Recent Developments in the Application of Closed Circuit Fine Grinding

Possibilities in Portland Cement Manufacture

By A. Anable
Engineer, The Dorr Co., New York

IN AN article in the January 5, 1929, issue of ROCK PRODUCTS* the author commented on the similarity of purpose in fine grinding in the metallurgical and cement industries and ventured the opinion that the cement industry would be benefited by a general adoption of that method of grinding—wet closed circuit grinding—which for a decade or so has been universally used in the preparation of metalliferrous ores for extraction treatment. The statement was made that, based on metallurgical experience, closed circuit grinding should prove of value in wet process cement manufacture to the following extent:

1. Closed circuit grinding should increase mill capacity 50%.
2. Closed circuit grinding should reduce wear on mill liners and grinding media 25%.
3. Closed circuit grinding should produce consistently a uniform 200-mesh product.

The year just ended has yielded some interesting new data which have extended materially the knowledge of just how cement making materials should react to closed circuit grinding. As a result of this a large middle western plant is now proceeding with the first commercial scale closed circuit grinding installation. A discussion of investigations conducted during 1929 at test plants and the new facts disclosed may prove of interest to cement manufacturers and at the same time bring the author's previous article up to date.

New Analyses of Fine Grinding Costs in the Metallurgical Industry

Field studies made last summer and discussed in a recent paper of J. V. N. Dorr and A. D. Marriott before the American Institute of Mining and Metallurgical Engineers, resulted in the compilation of new figures on the power required for fine grinding. These unit power consumptions for fine grinding are materially lower than corresponding figures for cement grinding and indicate that there exists today considerable room for improvement in cement raw grinding practice.

Modern metallurgical grinding practice recognizes not only the closing of all grinding circuits, primary, secondary and tertiary, with mechanical classifiers, but also the interposition of mechanical classifiers in open circuit between grinding stages and the placing of mechanical classifiers between the last stage of crushing and the first stage of grinding. Briefly every attempt is made to remove primary slime at the outset, and finished material from and between each stage

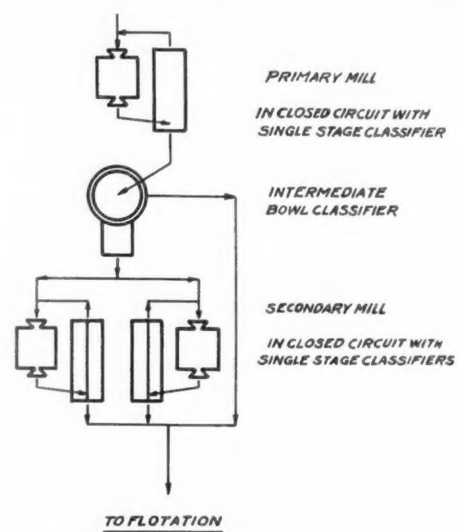


Fig. 1. A representative two-stage the grinding flowsheet widely used in the metallurgical industry

of grinding as soon as it has been reduced to the fineness intended for that particular stage.

Power Consumption

Although some of the western mills have adopted three stages of fine grinding, average good practice today would seem to conform to the flowsheet shown as Fig. 1, with primary closed circuited mills, intermediate open circuit bowl classifiers and secondary closed circuit mills. Unit power consumptions for fine grinding at eight copper properties, tabulated below and taken from the paper referred to above, show to what extent these companies have successfully reduced costs far below the best in cement practice, notwithstanding the fact that average porphyry copper ore is about one and a half to twice as hard to grind as the average cement rock.

Unit power consumptions are expressed in terms of minus 100-mesh and minus 200-mesh material actually produced in the mills since 100-mesh grinding is believed to correspond roughly with present cement grinding to 95% minus 100-mesh and since the cement practice of the immediate future will probably require the grinding of all raw materials down to the 200-mesh range. Differences in unit power consumptions are largely due to conditions in ore hardness, local conditions and metallurgical objectives.

UNIT POWER CONSUMPTION FINE GRINDING IN WESTERN COPPER PLANTS

	Kw.h. per ton	
Plant	100 mesh	200 mesh
A	7.90	10.80
B	8.53	9.73
C	8.95	11.66
D	9.20	11.69
E	10.10	13.10
F	10.61	14.56
G	10.74	14.80
H	11.93	11.69
Average	9.74	12.25
Average equivalent per bbl. cement	*2.93	3.68

* 600 lb. dry raw materials taken as equivalent to 1 bbl. finished cement.

In closed-circuit grinding as practiced at the above metallurgical plants, the grinding mill and the classifier which operates in closed circuit with it, are mechanically connected, so that the material in process of reduction may flow through the system by gravity or, in some cases, aided by conveyors and elevators. The arrangements generally used are shown in Figs. 2 and 3.

Fig. 2 represents a typical closed circuit layout for primary grinding, capable of reducing crusher product ½-in. to 1½-in. size to from 28 to 65-mesh. The crushed product enters the mill through the feed scoop, finished products escape over the slime discharge lip of the classifier and unfinished oversize is recovered at the sand discharge lip of the classifier and returned to the mill feed box for further grinding.

Fig. 3 is a typical layout for secondary grinding, capable of reducing the primary classifier overflow to 200-mesh or finer if desired. Feed enters the bowl through a centrally located loading well. Finished product escapes as bowl overflow, and unfinished oversize is recovered as a sand discharge and fed to the mill feed box for further reduction.

The arrangements of equipment are quite similar in primary and in secondary grinding, whatever difference there is being due to the selection of single stage classifiers for coarse separations with the primary mill stage and bowl classifiers for fine separations with the secondary mill stage.

* "Closed Circuit Fine Grinding and What It Should Accomplish in the Cement Industry," by A. Anable.

Recent Laboratory Studies of Burning Characteristics of Open and of Closed Circuit Ground Cement Slurries

Certain physical, thermal and chemical conditions are essential for correct burning, especially in the making of high early strength cement. These conditions may be summarized as follows:

1. Fineness.
2. Temperature.
3. Time of contact in zone of maximum temperature.
4. Chemical composition.
5. Physical structure.

Closed circuit grinding was regarded as a possible method of improving cement practice in so far as fineness was an essential requirement. From data on its use in metallurgy, it was expected to prove helpful in the cement industry for the following reasons:

1. A definite control of fineness.
2. A better mixing of the raw materials before burning.
3. Better grinding economy through reduced power consumptions and smaller mills.

From researches in the cement industry it was known that the finer the grinding the more complete was the chemical combination in the kiln and the greater the reduction in free CaO, all other factors such as temperature and time of contact remaining constant.

Laboratory investigations were made to determine the effect of fine grinding upon the rate of combination, kiln operation and physical character of the cement. Briefly these studies showed that superfines of "flour" were not so important as usually supposed, but that the small amount of oversize material coarser than the critical mesh was largely responsible for incomplete combination, unsoundness due to free CaO, and the necessity of high temperatures to counteract the effect of the oversize. The importance of a closed circuit ground slurry as an aid in the manufacture of high early strength cement was obvious.

Semi-Commercial Scale Tests to Determine Closed-Circuit Power Consumption on Cement Slurry

Encouraged by the results of the laboratory studies, semi-commercial scale tests were made at a large wet process cement plant in the east. The test installation consisted of a small scale ball mill, Dorr classifier and Dorr thickener, arranged so that measured amounts of the discharge from the coarse grinding compartment of a full scale compartment mill could be reground, to the desired finished size in the test unit and dewatered to the consistency of slurry.

Comparisons were made by operating the small mill first in open circuit and then in closed circuit, grinding the slurry to different degrees of fineness and determining the maximum output of the mill under each set of conditions. The table below shows the extent to which closed circuit operation was found to be superior to open circuit operation in point of increased grinding capacity and reduced unit power consumption.

COMPARATIVE RESULTS, OPEN AND CLOSED CIRCUIT GRINDING
(Secondary Stage Only)

	Lb. ground per hour	Kw.h. per bbl.
Grinding to 90% minus 200 mesh		
Open circuit	660	5.12
Closed circuit	1620	1.47
Grinding to 95% minus 200 mesh		
Open circuit	400	9.17
Closed circuit	1050	2.27

In all of these tests the feed to the experimental plant was 10% plus 14-mesh and 40% minus 200-mesh, as delivered by the large primary. The small mill consumed 3.48 kw. and the small classifier 0.37 kw. Through closing the mill circuit in 90% minus 200-mesh grinding the secondary mill's capacity was increased 145% and the unit power consumption reduced 71%. In

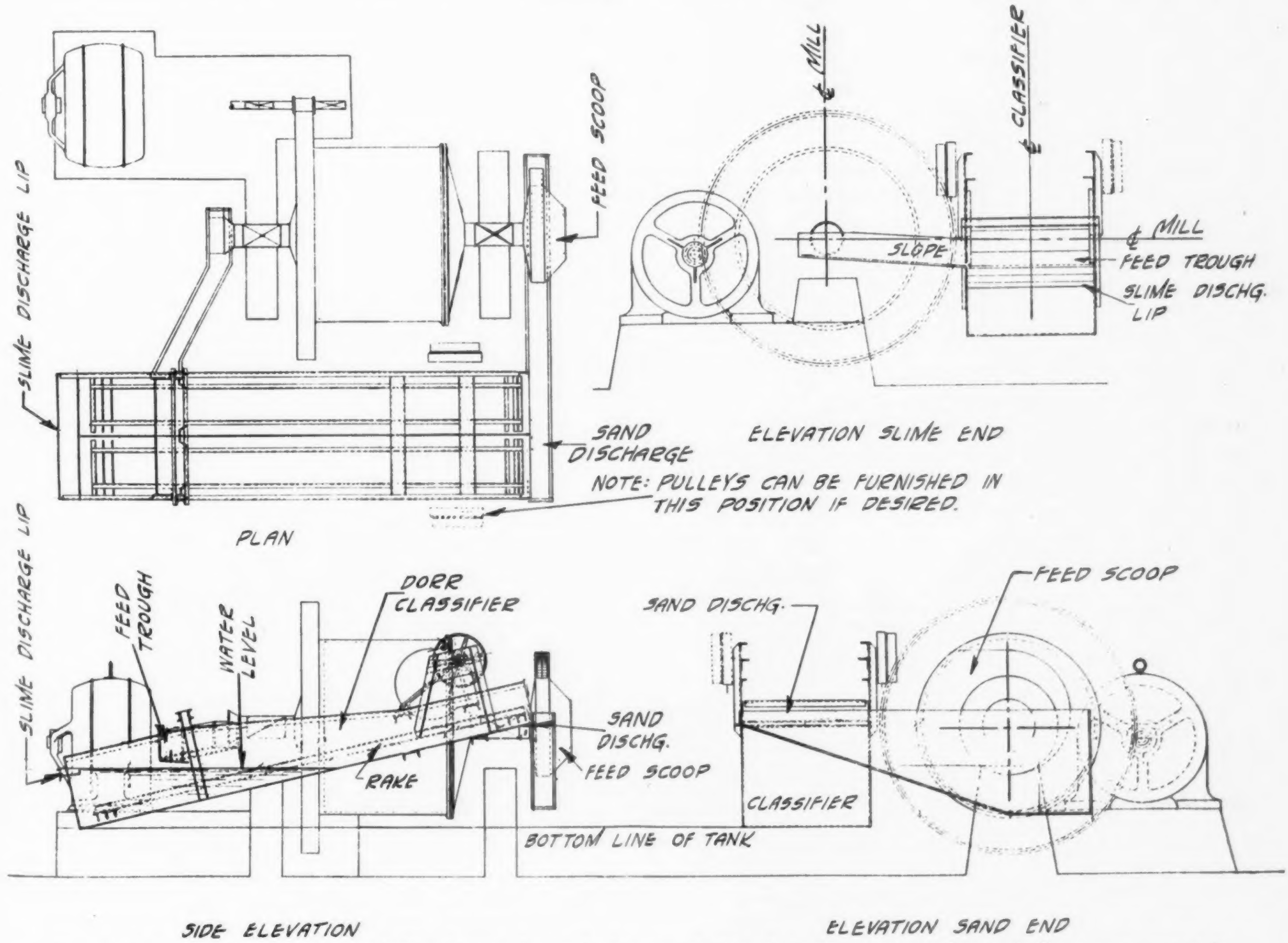


Fig. 2. Primary closed circuit grinding layout for reducing crushed rock to 35 to 65 mesh. A similar arrangement is practicable with primary stages of compartment mills

95% minus 200-mesh grinding, the capacity increase was 162% and unit power reduction 77%.

Due to the great difference in size between the experimental mill and the fine grinding mill in use at this plant a close agreement in open circuit unit power consumptions was not expected. Nevertheless, the 5.12 kw.h. per bbl. obtained with the experimental mill is not far out of line with the 4.06-kw.h. per bbl. estimated for the fine grinding mill under the same conditions, charging the fine mill, containing 75% of the total ball load, with 75% of the 373 kw. required to grind 69 bbl. of slurry per hour.

Samples of the cement slurry prepared in the semi-commercial installation were burned under carefully controlled conditions and the clinker and finished cement produced therefrom subjected to the usual tests to determine fitness. General conclusions drawn from this work were:

1. The slurry prepared by closed circuit grinding is as readily burned as the slurry prepared by open circuit grinding.

2. The nearer the reaction approaches completion the greater is the advantage of the closed circuit product.

3. The more difficult are the raw materials to burn, the greater is the advantage of the closed circuit product.

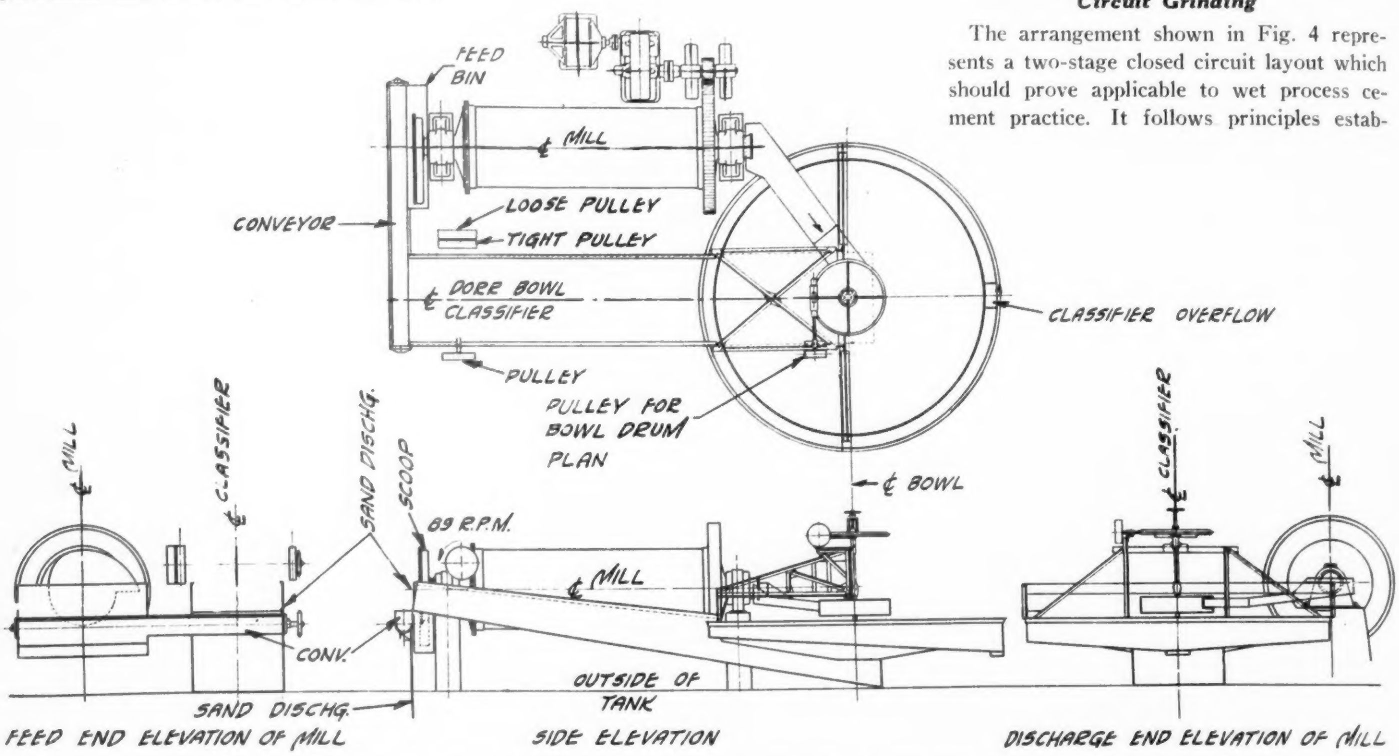


Fig. 3. Secondary closed circuit layout for reducing primary stage discharge to 95% to 100% minus 200-mesh. A similar arrangement is practicable with secondary stage of compartment mills

Material Coarser Than Critical Mesh Responsible for Incomplete Reaction

As stated before, the research studies revealed the fact that superfines do not have the beneficial effect on combination to the extent usually supposed, but that coarser than critical mesh material, plus 100 and 150-mesh, for instance, are chiefly responsible for free lime in the clinker and consequent unsound cement. In other words, the trouble lies in eliminating the last few per cent. of oversize rather than in producing a preponderance of excessively fine material. Consequently a slurry practically all just fine enough to pass a sieve of the critical mesh is superior to one with the greater amount much finer than critical size but with a small amount of a great deal coarser.

Closed Circuit Grinding Reduces Oversize and Benefits Calcining Reactions

On this basis closed circuit grinding is superior to open circuit grinding even when both are producing slurries, the same per cents. of which will pass a 200-mesh sieve. In the case of slurry prepared in a closed circuit mill, the oversize was found to be chiefly finer than 150-mesh with only a trace of 100-mesh, while on the other hand, the open circuit slurry contained appreciable amounts of material of all sizes with even a trace of 28-mesh material. The table below shows the distribution of oversize, averaged from seven large mill samples and the distribution of oversize in closed circuit products obtained in seven tests producing slurries of varied fineness. Particular attention is invited to the oversize distributions of the large mill product and to the closed circuit product of test No. 6, since both samples contain substantially the same amounts of minus 200-mesh material, yet the distributions of the oversize are widely divergent.

Suggested Layout for Cement Closed Circuit Grinding

The arrangement shown in Fig. 4 represents a two-stage closed circuit layout which should prove applicable to wet process cement practice. It follows principles established in metallurgy and should work equally well in the cement industry.

Use of Thickeners on Slurry

The finished material from the two-stage grinding installation is settled in a thickener which continuously discharges the cement slurry at the proper consistency for vacuum filtration or for direct calcination in the rotary kilns. In addition to the control of slurry density, the thickener makes it possible to recover and reuse the excess water used for grinding and classification. The thickener, between the grinding plant and the correction tanks, in addition to controlling the slurry density and recovering excess water for reuse, serves to some extent as a large slurry storage basin, reducing the number of additional tanks required. Developed in metallurgy and widely used there in

DISTRIBUTION OF OVERSIZE, OPEN AND CLOSED CIRCUIT
(Secondary Stage Only)

Mesh	Open circuit grinding Large mill Average per cent	Closed circuit grinding—Experimental mill — Sample Number 1	2	3	4	5	6	7
+ 28	0.1	....	....	....	....	....	....	....
+ 48	0.3	....	....	....	....	....	....	....
+100	2.5	....	....	....	0.2	0.2	0.2	0.7
+150	5.6	0.8	1.6	1.4	1.6	3.2	4.2	6.3
+200	10.1	4.0	4.9	5.6	7.0	8.2	9.11	2.3
—200	89.9%	96.0	95.1	94.4	93.0	91.8	89.9	87.7

sizes up to 325 ft. in diameter, the continuous thickener is as reliable a piece of apparatus as the classifier and rarely consumes more than 5 hp. for operation.

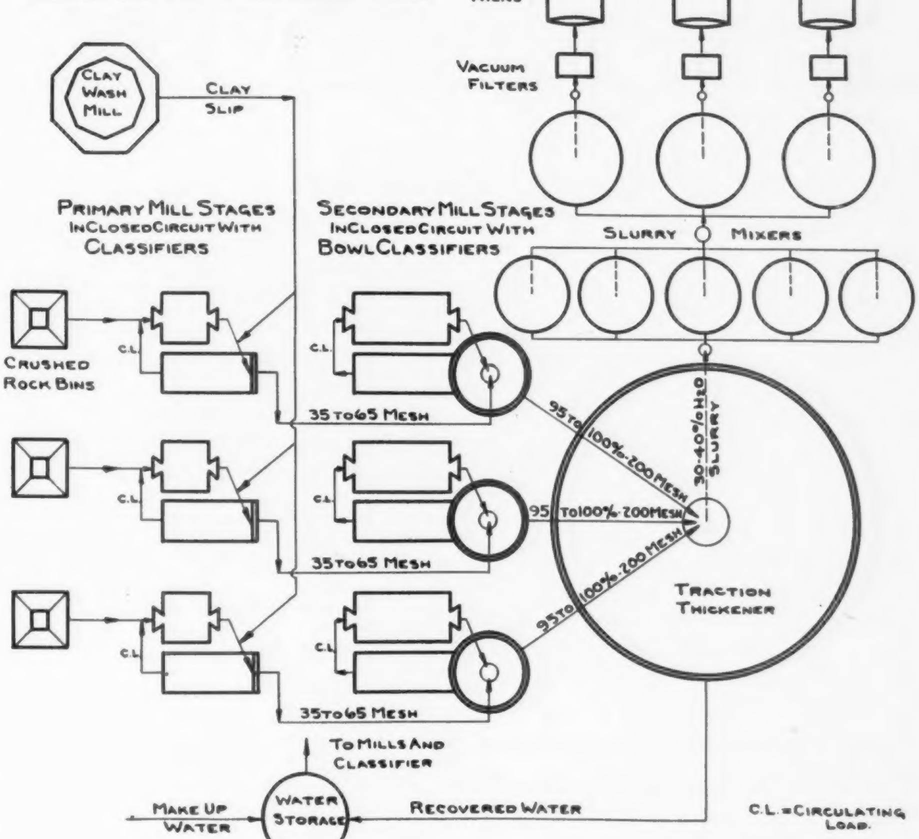
The Rotary Cement Kiln

THE first of a series of articles by W. Gilbert on the rotary kiln in cement manufacture appears in a recent issue of *Cement and Cement Manufacture* (England). The author considers the laws governing heat transmission from hot gases to the raw materials in the kiln and from hot clinker to the air passing through the cooler. He uses a wet-process kiln, 200 ft. long and 10 ft. by 8 ft. 6-in. dia., as a basis for his calculations. A fuel ratio of 26.46%, based on per cent. of clinker, he considers typical of such a kiln's performance.

Under the heading "Kiln Details," two usual types of slurry feed—adjustable orifice with constant head and rotary feed—are described and illustrated, their advantages and shortcomings listed, etc. Several types of coal feeders are described also. He gives the slope of the kiln to be about 1 ft. for every 24 ft. of length and the speed at 0.85 r.p.m.

In discussing fuel losses, the author states that cold air in-leakage was chiefly responsible for the low efficiencies of early kilns. He states that better fuel ratios obtained in modern kilns up to 250 ft. in length are not due to this increase in length but rather to: 1. Better recovery of the heat in the clinker; 2. Reduction of excess air used in burning to about 5%; 3. Improved mechanical details of kiln operation; 4. Larger diameter kilns, resulting in less tendency for rings to form.

Fig. 4. Suggested flowsheet for closed circuit cement grinding (individual mills shown for simplicity of flow lines but similar arrangement already worked out for compartment mills)



Classification

CLASSIFICATION in general, and as specifically applied to the cleaning of feldspar, is the subject of technical paper No. 456 of the U. S. Bureau of Mines, Department of Commerce. The author is W. S. Coghill. Much of the paper does not interest the rock products industry as a whole, although interesting to those branches which employ table concentration such as feldspar, phosphate rock and a few others. But the part that treats of the theory of classification is of interest to all those branches in which the finer sizes of material may be sized in the wet way.

The author looks on the methods of designing classifiers by laws of falling bodies, formulas and coefficients as mental gymnastics, preferring to base design on practical observations of the material to be classified. In this he is correct, although observation does not get the designer very far without a fairly good knowledge of the theoretical principles involved. For the observations preliminary to the work described he used a simple glass tube classified with a constriction plate, hydraulic water being supplied directly from the sink tap.

In his opinion the most desirable quality of a classifier is that it should be a good sizer, the only quality of much importance in the rock products industry. And his tables and diagrams show that it may be made a very satisfactory sizer, especially on the finer sizes for which screens are impractical.

The things which are of especial interest in this paper are the method of calculating the tonnage to each spigot of a classifier, the method of finding the mean mesh and the method of representing the work of the classifier graphically. Tonnage is calculated by sizing the feed through the double Tyler series of sieves and then dividing the sizes by the number of spigots and finding from the weight of each mesh size what the feed to each spigot should be. In the example given there are 15 spigots and 20 sizes. Each spigot is allowed a size and a half and the tonnage runs from 0.16% to 14.81% of the feed. It is explained that commercial considerations have to govern and that the ideal distribution cannot always be had.

The method of finding the mean mesh size is that of the force diagram considering the weight of each product as a force working on a lever arm, hinged at the coarsest mesh. The "moment" is the weight times the distance on the arm represented by the screen size and the resultant is the mean mesh. In the example given these "moments" add to 272, and this divided by 100, the sum of the percentages into which the sizes are distributed, gives 2.72 as the mean mesh, which is to say that the mean mesh comes 72% of the distance between the second and third screen. This is a truer mean than the average diameter ordinarily taken.

The method of showing the work of the classifier graphically is that of laying off points at distances corresponding to the weights of each screen size on horizontal lines representing screen sizes. These points are connected. By doubling the figure, that is laying off the weights on both sides of a center line, a symmetrical polygon is obtained for each product and the shape shows at a glance the actual work of the spigot that has been plotted.

The methods of finding the mean mesh and of plotting the results are the same as those used by Mr. Goghill for evaluating the work of crushers. His paper on this subject was abstracted in the June 8, 1929, issue of ROCK PRODUCTS. Obviously it could be applied to screening and to any other work in which are to be compared either by sizes or by the weights on any mineral present.

Copies of this paper may be had from the Government Printing Office, Washington.

Hints and Helps for Superintendents

Mud Mats

WHERE a dragline excavator is working in swampy or soft ground, mud mats are a necessity; these mats are usually constructed of heavy planking, 6x12's, and with a width of 4 to 8 ft. with any convenient length and in the form of a rectangle. Occasionally one finds mats constructed with the ends dovetailed, as shown in the illustration, and the value of this design is obviously due to the fact that they do not have to be laid with extreme accuracy to insure a continuous path for the pipe rollers on which the excavator advances.

In the center of each mat is a ring so placed as to be below the mat floor level and when it is desired to move the mat a rope sling is passed through the loop and the transfer made by the excavator.

Dovetailed mud mats over which the dragline excavator advances

Safety Ladder for Hopper Cars

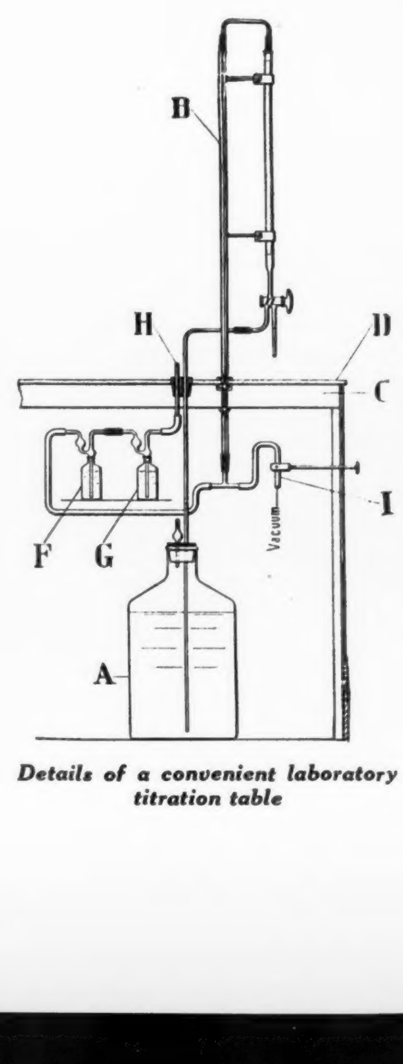
TO DISCOURAGE men from entering hopper cars to push down coal, ore, etc., the Bessemer and Lake Erie Railroad Co. has developed a safety ladder shown in the accompanying illustration. This is a short steel ladder with hooks at the top to hook over the side of the car, and a platform about 3 ft. from the top on which a man can stand. In this position he can remain comfortably and use both hands in working down the material with a long rod.—*National Safety News.*

Safety ladder for hopper cars

Laboratory Titration Table

THE accompanying figure shows a convenient arrangement for a laboratory titration table which presents a neat appearance. *A* is a 20- or 40-liter bottle which is set on the floor below the table. In one hole of the stopper is inserted a soda-lime tube through which air enters as the solution is used. Through a second hole runs a glass tube reaching to the bottom of the bottle and connecting with the three-way stopcock of the buret. The buret is mounted on a special rod, *B*. This rod is hollow and has two clamps welded on in the positions shown in the figure. The rod is threaded for several inches at the lower end and by means of two nuts is clamped to the wooden table top, *C*. The working surface of the table, *D*, is of white Vitrolite, and it is not desirable to put any pressure on this material. At the point where the rod passes through the table a thin, loose collar, similar to those used in plumbing practice where faucets are attached to porcelain, is used. Both ends of the rod are finished for rubber-tube connections. At the top an inverted U-shaped glass tube makes the connection between the top of the rod and the top of the buret. At the bottom the rod is connected by means of rubber tubing to a tee. From one branch of the tee tubing runs to a valve on the vacuum line, *E*. The handle for operating the valve is placed on the front of the table. The other branch of the tee is connected through the trap bottles, *F* and *G*, to the open glass tube, *H*, which just projects through a rubber stopper set in the top of the table. The trap bottles are filled with soda-lime to filter the air which enters at *H*.

To fill the buret, the vacuum is turned on and the stopcock of the buret is set to connect with the stock bottle. By placing a finger on the open end of the tube, *H*, the



Details of a convenient laboratory titration table

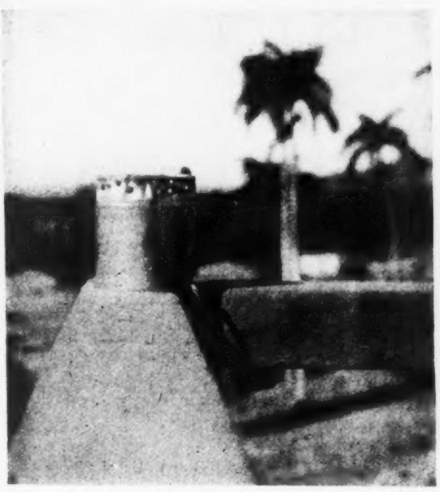
flow of the solution into the buret can be controlled.

Any number of these units can be combined to provide for the standard solutions which are in regular use. The only parts of the apparatus visible above the table are the burets, supporting rods and short lengths of glass tubing attached to the bottoms of the burets. A nickel-plated finish for the rods and clamps is satisfactory in the laboratory. The burets can be removed easily for cleaning or calibrating.—*Anal. Edit., Ind. and Eng. Chem.* (1930), **2**, 1.

Sanitary Drinking Cups

AT the plant of the Cuban Portland Cement Co., Mariel, Cuba, as well as at many other industrial plants on the island, a drinking cup of rather unusual design can always be found around the many springs and drinking fountains.

The cup consists of a can with a ¼-in.



A sanitary drinking cup

hole punched on the side near the bottom, and to use one fills the cup about half full, tipping the can at first so the water does not run out the hole, and when the hole is a few inches from the drinker's mouth, leveling off causes the water to stream all over one's shirt front if his aim is poor, but the natives are quite adept at the operation.

A simple way would be to sneak a drink from the cup in the usual way, but several rows of holes at the edge prevents this experiment.

Some Experiences with a Tractor in a Quarry

By F. J. MACDONALD
Beacon, N. Y.

WHILE serving as quarry mechanic at a large crushing plant near Coblesville, N. Y., it fell to my lot to have a wide and varied experience with a second-hand Linn tractor. It arrived at the plant several years ago and surely has had a record. The motor was a Continental and was a good one, running for years with much abuse and very little attention. The caterpillar mechanism was badly worn when it first came under my observation.

After several years' use, one day when most needed the old tractor refused to move ahead. A takedown revealed the internal sprocket gears were very badly worn. A new pair cost $350 and the tractor was not thought worth this expense. New pinion gears with ball bearings were purchased, and by cutting out or slotting the yoke bearing the gears were shoved closer in mesh, and again it started with a new lease of life.

A few years later a careless operator burned the crown sheet of the dinkey, nearly blowing it up, and while it was undergoing repairs the tractor was used to pull the loaded stone cars to and from the crusher. Later the locomotive became almost useless, so it was put to work pulling empty cars (for loading) up the sidetrack from the main line, a distance of 1¼ miles. It would handle three or four empties very nicely up a 10% to 15% grade. Slow but sure. After eight or nine years of service the firm went bankrupt and the machinery and equipment were sold to a wealthy man from New York. The old superintendent was hired to oversee the loading, and he came after me from another job to look after the mechanical end.

Of course, among the assets of the place was the old familiar tractor. It was the only thing available to haul the heavy machinery from the quarry down to the cars to be loaded and pull the empties up the line; there were about 36 cars to be loaded.

We worked around six months dismantling and loading, and the old tractor proved the best friend we had. We hitched to the old steam dinkey and pulled it along over the ground (on its wheels) as easily as you would pull a rat by the tail, and the old air compressor bed was handled in a similar manner.

We hitched to a hoisting cable to raise and lower the heavy parts, and it was indispensable. During the last of the loading, one day, pulling up cars, it failed to move ahead. We found one of the jack shaft bearings broken and the balls lost. To order new parts meant a serious delay, and the old thing was not worth it. All we wanted was to finish the job, so we decided on a quick repair.

The jack shaft was easily removed or pulled out (floating axle) and wiped clean. The housing was also wiped, warmed with a gas torch and the shaft wrapped with a thickness of paper and replaced. After centering in the housing, some old rags were stuffed in around the shaft. The job was faced with clay (to prevent any possibility of babbitt leaking in the differential housing) and the hole poured full of babbitt.

The tractor was started and ran all right for a short time, but failed again. The operator and others thought the babbitt bearing had gone out, but examination showed that the tail (drive shaft) bearing had gone out. It was babbitted the same as the jack shaft. We finished the job all right and the owner ordered it shipped on the last load. The old superintendent was hired on the new job (145 miles down the Hudson river) and hired me to go along.

One of the first things to come to our attention was our old friend the Linn tractor. (It surely did look familiar.) They thought they had a prize. Built a new platform on it and gave it some extra touches, and, remarkable to say, it performed very nicely nearly all the season, hauling machinery around to places. A skip developed and we found the No. 4 piston worn out—not even one whole ring in it, two entirely gone and the others broken! A new piston and all new rings were placed and the engine was fine again. It hauled heavy loads of sand and cement up the mountain, for a dam, where it was impossible to go with anything else. I used it again last fall to haul heavy timbers up the mountain, to build bridges. The motor starts in any weather, runs and idles like a new one. The ignition system is a Bosch magneto. I am sure that readers will agree that this old machine has a wonderful record.

Hard-Surfacing Edges of a Drag Scraper

AN interesting application of hard-surfacing rock products equipment appears in a recent issue of *Oxy-Acetylene Tips*. The drag scraper had been in service for a considerable time, working in rough and abrasive material, which caused wear on the edges. A small amount of Haynes Stellite was applied for about ½-in. back from the wearing edge resulting in a great reduction in the amount of wear, the article states.

Edges of drag scraper resurfaced with an abrasive-resistant alloy

Portland Cement Output in February

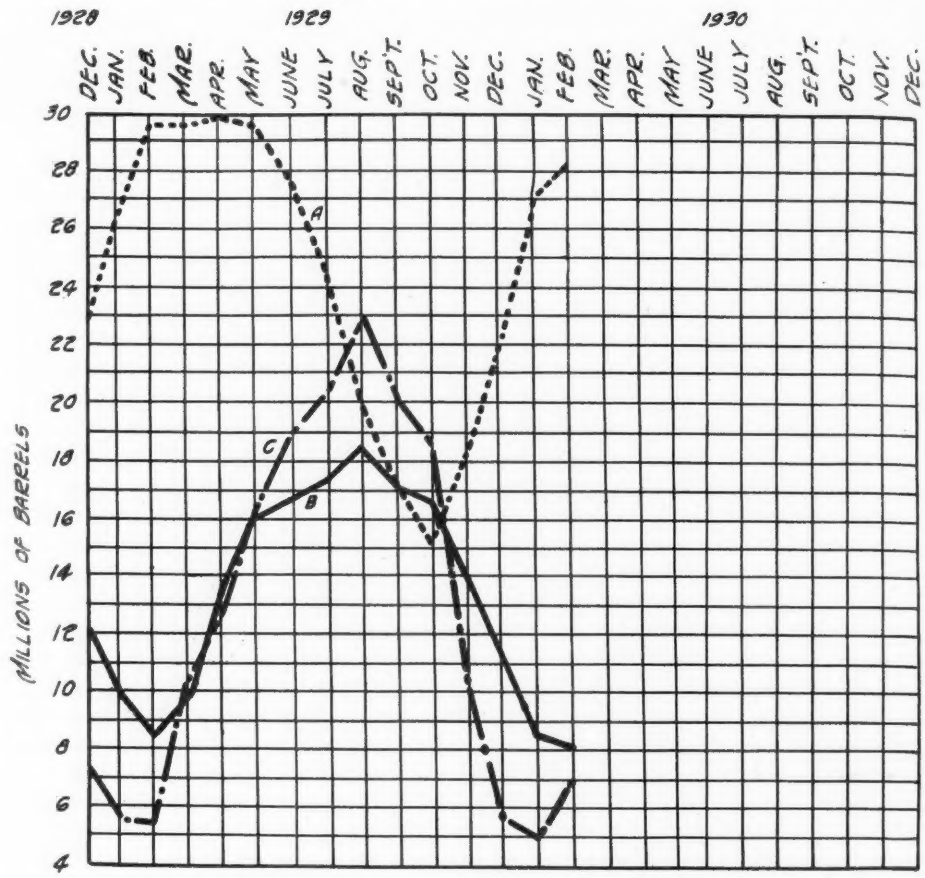
THE portland cement industry in February, 1930, produced 8,162,000 bbl., shipped 7,012,000 bbl. from the mills and had in stock at the end of the month 28,231,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in February, 1930, showed a decrease of 4.2% and shipments an increase of 28.7%, as compared with February, 1929. Portland cement stocks at the mills were 5.5% lower than a year ago.

The statistics here presented are compiled from reports for February from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants at the close of February, 1930, and of 160 plants at the close of February, 1929. In addition to the capacity of the new plants which began operating during the 12 months ended February 28, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

RELATION OF PRODUCTION TO CAPACITY

	February 1929 Pct.	February 1930 Pct.	Jan. 1930 Pct.	Dec. 1929 Pct.	Nov. 1929 Pct.
The month	44.8	41.5	38.8	51.5	66.6
12 months ended	71.0	65.6	65.5	66.4	66.8



(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during December, 1928 and 1929, and January, 1929 and 1930:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN DECEMBER, 1928 AND 1929, AND JANUARY, 1929 AND 1930, IN BARRELS*

Shipped to	1928—December	1929	1929—January	1930
Alabama	123,522	115,961	125,356	106,309
Alaska	132	962	132	1,590
Arizona	42,385	46,831	55,771	49,286
Arkansas	69,131	84,761	47,087	43,629
California	859,234	728,509	950,884	561,220
Colorado	24,317	32,359	27,709	14,818
Connecticut	97,419	62,419	57,087	63,245
Delaware	14,122	11,737	10,183	12,810
District of Columbia	53,681	44,485	60,476	44,747
Florida	97,857	84,792	93,827	91,344
Georgia	98,912	101,776	92,494	87,956
Hawaii	20,659	19,772	21,829	27,413
Idaho	5,533	6,642	3,266	2,585
Illinois	469,527	263,469	211,894	182,347
Indiana	133,155	108,261	65,421	94,596
Iowa	34,397	35,737	17,701	34,357
Kansas	93,623	105,763	43,008	45,558
Kentucky	63,567	46,660	33,118	32,854
Louisiana	74,396	171,845	96,054	175,009
Maine	11,944	19,014	10,011	14,125
Maryland	90,219	79,751	60,058	80,253
Massachusetts	136,456	101,340	85,539	104,522
Michigan	368,112	224,563	247,190	203,440
Minnesota	52,903	52,991	30,494	59,107
Mississippi	90,745	64,336	83,044	52,518
Missouri	193,691	142,398	91,914	76,507
Montana	11,889	8,041	3,525	6,175
Nebraska	32,472	33,088	16,113	22,811
Nevada	4,029	8,279	6,703	5,452
New Hampshire	19,477	13,915	17,988	9,598

Shipped to	1928—December	1929	1929—January	1930
New Jersey	383,075	281,867	238,270	257,563
New Mexico	15,068	10,437	30,915	10,758
New York	1,150,410	722,146	746,897	681,645
North Carolina	148,245	66,152	108,492	64,998
North Dakota	4,237	2,161	2,020	2,787
Ohio	351,927	253,060	250,972	243,570
Oklahoma	220,102	213,739	153,893	99,486
Oregon	39,466	49,698	33,364	25,776
Pennsylvania	539,402	435,580	378,421	442,728
Porto Rico	0	4,500	500	1,750
Rhode Island	43,188	24,096	16,956	22,295
South Carolina	92,059	67,813	96,379	44,806
South Dakota	6,722	12,744	4,414	11,204
Tennessee	138,090	136,191	96,513	85,912
Texas	379,921	428,688	482,644	299,248
Utah	15,132	23,560	13,185	12,529
Vermont	11,026	17,560	8,794	21,257
Virginia	97,175	68,406	86,620	71,683
Washington	132,183	101,062	111,351	47,785
West Virginia	46,917	50,471	33,367	48,025
Wisconsin	114,668	80,278	57,769	77,039
Wyoming	4,428	6,690	4,216	2,755
Unspecified	502	0	12,410	8,760
	7,321,439	5,877,356	5,634,328	4,890,540
Foreign countries	62,561	73,644	72,672	64,460
Total shipped from cement plants	7,384,000	5,951,000	5,707,000	4,955,000

*Includes estimated distribution of shipments from three plants in December, 1928 and 1929, and in January, 1929; from two plants in January, 1930.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	1929—Production	1930	Stock at end of month 1929	1930
January	12,012,000	10,504,000	9,642,000	9,646,000
February	11,255,000	10,008,000	12,436,000	11,573,000
March	12,450,000	....	14,948,000	....
April	14,166,000	....	15,479,000	....
May	15,444,000	....	14,911,000	....
June	15,312,000	....	13,587,000	....
July	15,214,000	....	11,619,000	....
August	15,829,000	....	8,995,000	....
September	15,165,000	....	7,009,000	....
October	15,515,000	....	5,934,000	....
November	14,087,000	....	6,134,000	....
December	12,539,000	....	7,526,000	....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN FEBRUARY, 1929 AND 1930, AND STOCKS IN JANUARY, 1930, IN BARRELS

District	Production 1929–February	Production February–1930	Shipments 1929–February	Shipments February–1930	Stocks at end of month 1929	Stocks at end of month 1930	Stocks at end of Jan. 1930*
Eastern Penn., N. J., Md.	2,199,000	2,033,000	1,354,000	1,419,000	6,933,000	6,689,000	6,075,000
New York and Maine	412,000	187,000	232,000	257,000	1,984,000	1,545,000	1,615,000
Ohio, West'n Penn., W. Va.	829,000	762,000	442,000	651,000	3,611,000	3,401,000	3,289,000
Michigan	525,000	543,000	302,000	297,000	2,658,000	2,754,000	2,509,000
Wis., Ill., Ind. and Ky.	862,000	883,000	373,000	664,000	3,911,000	4,145,000	3,926,000
Va., Tenn., Ala., Ga., Fla., La.	887,000	727,000	662,000	881,000	2,180,000	1,598,000	1,753,000
East'n Mo., Iowa, Minn., S. D.	678,000	748,000	215,000	492,000	4,353,000	3,396,000	3,140,000
Western Mo., Neb., Kans., Okla. and Ark.	482,000	709,000	311,000	764,000	1,782,000	1,834,000	1,889,000
Texas	399,000	482,000	416,000	521,000	513,000	779,000	817,000
California	1,071,000	755,000	984,000	793,000	871,000	1,130,000	1,168,000
Colo., Mont., Utah, Wyo., Ida.	74,000	130,000	57,000	104,000	541,000	441,000	415,000
Oregon & Washington	104,000	203,000	100,000	169,000	533,000	519,000	485,000
	8,522,000	8,162,000	5,448,000	7,012,000	29,870,000	28,231,000	27,081,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	Production 1929	Production 1930	Shipments 1929	Shipments 1930	Stocks at end of month 1929	Stocks at end of month 1930
January	9,881,000	8,498,000	5,707,000	4,955,000	26,797,000	*27,081,000
February	8,522,000	8,162,000	5,448,000	7,012,000	29,870,000	28,231,000
March	9,969,000	....	10,113,000	....	29,724,000	....
April	13,750,000	....	13,325,000	....	30,151,000	....
May	16,151,000	....	16,706,000	....	29,624,000	....
June	16,803,000	....	18,949,000	....	27,505,000	....
July	17,315,000	....	20,319,000	....	24,525,000	....
August	18,585,000	....	23,052,000	....	20,056,000	....
September	17,223,000	....	19,950,000	....	17,325,000	....
October	16,731,000	....	18,695,000	....	15,381,000	....
November	14,053,000	....	11,222,000	....	18,213,000	....
December	11,215,000	....	5,951,000	....	23,550,000	....
	170,198,000	....	169,437,000	....	....	....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN FEBRUARY, 1929 AND 1930, IN BARRELS

District	Production 1929	Production 1930	Stocks at end of month 1929	Stocks at end of month 1930
Eastern Pennsylvania, New Jersey and Maryland	2,899,000	2,415,000	2,063,000	1,785,000
New York and Maine	479,000	344,000	1,153,000	970,000
Ohio, Western Pennsylvania and West Virginia	1,102,000	1,041,000	1,469,000	1,496,000
Michigan	733,000	758,000	1,089,000	1,370,000
Wisconsin, Illinois, Indiana and Kentucky	1,630,000	1,539,000	1,769,000	1,511,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,177,000	758,000	1,292,000	770,000
Eastern Missouri, Iowa, Minnesota and South Dakota	923,000	893,000	817,000	728,000
Western Missouri, Nebraska, Kansas. Oklahoma, Arkansas	648,000	796,000	696,000	383,000
Texas	430,000	451,000	182,000	538,000
Colorado, Montana, Utah, Wyoming and Idaho	84,000	135,000	405,000	258,000
California	930,000	701,000	1,082,000	1,261,000
Oregon and Washington	220,000	177,000	419,000	503,000
	11,255,000	10,008,000	12,436,000	11,573,000

Exports and Imports

(Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision)

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN JANUARY, 1930

Exported to	Barrels	Value
Canada	3,373	$ 15.380
Central America	26,271	78,750
Cuba	7,528	18,402
Other West Indies and Bermuda	5.431	12.128
Mexico	16,381	47,782
South America	18,050	90,598
Other countries	5,353	30,095
	82,387	$293,135

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN JANUARY, 1930

Imports from	District into which imported	Barrels	Value
Belgium	Los Angeles	96,477	$ 62,878
	Massachusetts	25,714	35.251
	Oregon	3,000	3,588
	Total	125,191	$101,717
Denmark	New York	10,000	$ 10,498
	Porto Rico	57,400	80,134
	Total	67,400	$ 90,632
France	Massachusetts	925	$ 1,858
	New York	801	1,762
	Total	1,726	$ 3,620
Germany	Los Angeles	950	$ 1,735
United K'gd'm	Los Angeles	496	$ 2,194
	New York	4,839	6,106
	Philadelphia	1,007	1,457
	Total	6,342	$ 9,757
	Grand total	201,609	$207.461

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN JANUARY, 1930

	Barrels	Value
Alaska	854	$ 2.516
Hawaii	26,967	74.047
Porto Rico	1,251	2.308
	29,072	$78.871

Japanese Cement Production

DECREASED demand from private works and the retrenchment policy of the Japanese government, the largest individual user of cement in the country, is indicated in a recent report appearing in *Cement and Cement Manufacture* (England). Production shows an increase over 1928, and though sales have mounted, they are not enough to offset the increases brought about by expansion of several mills. In view of these facts and fearing a large overproduction, the Japan Cement Mills Association extended its curtailment of production program so that at the end of 1929 the average restriction was about 36.8% of capacity.

The association also decided to change the method of production curtailment. Previous methods were based on the capacity of each plant and the ratio fixed according to productive capacity. Under the new, production is restricted on the basis of process of production, the ratio to have general application, except for some smaller mills. The new restriction ratio, 40%, is the largest ever enforced and will result in a heavy reduction in output. This restriction is confined entirely to production for domestic consumption and may result in a vigorous attempt by Japanese mills to extend their export market.

Influence of Composition in Portland Cement Mixtures

A STUDY has been made of the influence of ferric oxide, magnesia and soda upon the temperature at which melting starts when they are added individually and collectively to mixtures of lime, alumina and silica. The mixtures had compositions similar to those of portland cement. It was found that these mixtures with lime, alumina and silica started to melt at 1455 deg. C. When ferric oxide was added, the temperature of liquid formation was reduced to 1340 deg. C.; with magnesia, to 1375 deg C.; with soda, to 1430 deg. C.; with ferric oxide and magnesia, to 1300 deg. C., and with three added components, to 1280 deg. C. The compounds observed at equilibrium in the clinkers made from lime, alumina, silica, ferric oxide and magnesia were found by microscopic and x-ray methods to be $3CaO \cdot SiO_2$, $2CaO \cdot SiO_2$, $3CaO \cdot Al_2O_3$, $4CaO \cdot Al_2O_3 \cdot Fe_2O_3$ and MgO. The investigation was conducted by W. C. Hansen, research associate, National Bureau of Standards, and results published as Research Paper No. 132.

Compilation and Use of Industrial Accident Statistics

SAFE PRACTICES Pamphlet No. 21, recently distributed by the National Safety Council, Chicago, discusses in detail the methods of collecting and tabulating industrial accident statistics. The data therein are of exceeding interest to all in charge of accident prevention work. A number of typical accident report and record forms are illustrated.

A companion pamphlet, No. 86, deals with the analysis and use of properly compiled accident statistics. No standard plan is recommended but various methods used by members are described and illustrated for the guidance of the safety director.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930

Month	Exports 1929 Barrels	Exports 1929 Value	Exports 1930 Barrels	Exports 1930 Value	Imports 1929 Barrels	Imports 1929 Value	Imports 1930 Barrels	Imports 1930 Value
January	78,639	$283,002	82,387	$293,135	151,302	$177.976	201,609	$207.461
February	58,886	225,590	....	....	118,930	123,123	....	....
March	69,079	235,164	....	....	131,909	112,788	....	....
April	64,145	218,316	....	....	89,668	114,281	....	....
May	57.955	219,366	....	....	200,646	267,854	....	....
June	96,055	287,612	....	....	203,545	228,170	....	....
July	71,992	247,177	....	....	182,098	199,960	....	....
August	60,013	225,762	....	....	183,938	199,403	....	....
September	86,268	308,631	....	....	112,372	152,239	....	....
October	101,359	337,839	....	....	172,566	187,504	....	....
November	53,378	198,197	....	....	96,568	95,844	....	....
December	88,403	297,255	....	....	84,358	79,098	....	....
	886,172	$3,083,911	....	....	1,727,900	$1,938,240	....	....

Industry and Depressed Price Levels*

Origin and Sustaining Causes of the Price Cutting Problem

By L. V. Alden
Vice-President, The Thompson and Lichtner Company, Ltd., Boston, Mass.

A LARGE majority of our industries have been faced at one time or another with a problem variously described as the "new competition," "profitless prosperity," or merely as the "price-cutting problem." This has been a veritable thorn in the side of good management and has resulted in untold losses to whole industries, particularly in the long established trades handling the more staple lines, wherein former competitive advantages have become, to a large extent, equalized.

The Stages of Competition

Most of our older industries which are suffering from what is termed the depressed price level problem, have already progressed through several clearly defined stages of competition, in all of which profits have been based upon various forms and modifications of monopoly, or competitive advantage. The pioneer stage appeared with the beginning of organized industry. At that period, monopolies were created by overcoming certain environmental limitations which then prevailed in such forms as lack of materials, machinery and equipment, capital, transportation facilities, skilled labor and so on.

Skill in surmounting these handicaps gave the enterprising manufacturer a virtual monopoly which, though limited in geographical area, was the basis of profitable operation and expansion. As railroad transportation developed and capital available for industrial purposes increased, the environmental limitations on which monopoly was based gradually came to be equalized and the second stage of competition appeared. This took the form of a monopoly of the product itself, based either on patents, secret processes, exceptional design, skill or product-making machinery.

The third stage has been characterized as the "era of scientific management." In this transition, attention has been changed from the competitive advantage as represented by patented products or processes to the monopoly of low manufacturing costs protected by exceptional administrative skill. During this period all the tools of modern management began to appear, such as time studies, wage incentives, production standards, inventory control and cost accounting.

As all competitors approach equal skill in this respect, a new basis of competition is necessary to produce profits. Thus we witness a gradual transition to the fourth stage, wherein monopoly is based upon management skill in merchandising. As this in turn tends to become equalized and does not indefinitely constitute a basis for even limited monopoly, again profits suffer and another stage of competition is reached.

*Reprinted from the *Executives Service Bulletin* of the Metropolitan Life Insurance Co.

The Price Cutting Stage

This is the price cutting or depressed price level period and is the one with which we are most concerned. It comes into being when there is a tendency toward equalization of competitive advantages.

CHARACTERIZING the price-cutting tactics which are demoralizing many industries as the fifth clearly defined stage of competition in industry, Mr. Alden discusses in this article the origin of the problem and the factors which make it difficult of solution. He declares that specialized education for industrial groups and accurate knowledge of the costs of his product on the part of the manufacturer are to be regarded as essential to effective co-operation.

The disturbing aspect of this situation is that under these conditions profitable price levels seem to be unstable. The individual, failing to make an adequate profit on the volume he now has, attempts to increase that volume partly by more intensive selling efforts and partly by lowering his price. Most of the increase secured by these methods must necessarily come from competitors, who must also adopt similar tactics and are virtually compelled to redouble their own selling efforts and depress their own prices.

The problem did not occur because of over-production, for this is a separate problem. It could not occur until there was over-capacity, but it did not occur because of this. Neither is it due to the action of the law of supply and demand, for under these conditions of over-capacity but not over-production which exist in the fifth stage of competition, supply and demand are equal at all levels of price.

A characteristic feature of this situation is the great emphasis placed upon special selling terms and discounts on free concessions and allowances of every nature, and upon similar expedients designed primarily as a smoke screen for the price cutters.

The problem is due, in large part, to the obscurity of the relationships involved, to the persistence of the illusion that price cutting may be profitable, and to the incorrect reasoning of one or more manufacturers of an industry in regard to price cutting policies. The fundamental difficulty rests in the fact that one manufacturer alone and independently can lower the price level of an entire industry, irrespective of the wishes of the remainder of his competitors in this respect; whereas, on the other hand, only the unanimous desire on the part of all members of the industry is adequate to maintain a normally profitable price level.

The great necessity at this stage is to devise a suitable means of protection, without at the same time curbing the interplay of free competition and the incentive to progress, and without incurring the liability to illegal combination, extortion or exploitation.

Co-operation the Sole Remedy

While many manufacturers realize that profitable price cutting is an illusion, they can do little of themselves to combat the problem, since even slight elevations in their own price would result in a disastrous loss of business. Co-operation alone is adequate to cope with the situation, but this in turn is most difficult to secure. On the one hand are very definite limitations and restrictions regarding co-operation which have been legally imposed on industry for the protection of the public. On the other hand is the persistent illusion of profitable price cutting, the confusing and obscuring factors which hide the illusion, and, still more important, the great antagonism and distrust between competitors engendered by the very keenness of competition which the unsolved problem has caused.

In theory, the depressed price level problem is simple, easily understood and readily remedied. In practice, it is a problem of great complexity, very hard to understand and most difficult to cure. The sustaining cause is not in the realm of economic or social law; it is in the mental qualities of the price cutting manufacturers of every industry and takes the form of ignorance, misunderstanding, antagonism, etc. The solution involves the curbing or elimination of these qualities.

To meet and overcome this condition, industry has available two effective possibilities. The first of these, applying particularly to industrial groups within a certain

section of the country, is industrial education conducted by the industry in co-operation with an agency such as a sectional trade or manufacturers' association. Campaigns along these lines have already done much to help the situation. The adoption of uniform methods of cost accounting, the publication of industrial statistics on stocks, prices and volume, and the determination of definite standards and specifications for product, all serve to replace doubt, uncertainty and confusion with definitely understandable facts.

Industrial education of the immediate future, however, should hit more directly at the cause of depressed price levels—at the illusion that competitive price cutting, either direct or disguised, can ever be profitable. On the foundation laid down in uniform costs, industrial statistics and standard product specifications, this can be done by analyzing, one by one, the various factors involved in the psychology of price cutting, by pointing out the utter futility of this reasoning as a means to greater profits; and by demonstrating the great possibilities which lie in the elevation of price levels. By hammering these indisputable facts home again and again to every member of every industry, the present influence on price level—human nature notwithstanding—can be reversed.

Many manufacturers, in sections of the country such as New England, face the price cutting problem on a national basis. That is, their competition is scattered over various sections of the country. These manufacturers obviously can accomplish little on a group basis and their hope of combatting the problem is a matter of individual ingenuity. It is encouraging to know that certain manufacturers, facing the most intense price cutting on a national scale, have been able, through properly directed efforts, to improve substantially their profit position.

The individual concern must begin to reason correctly, however, before any attempt is made in this direction. It must understand that volume alone is not a source of profits and it must realize that a sound and accurate basis of facts is absolutely essential to any marked success of these efforts. Among these facts, perhaps, a true knowledge of product costs is most necessary. Until these are accurately determined it is impossible to know the variations in net profit on the various items being sold, and therefore impossible to inaugurate a policy of selective selling which is the fundamental basis of overall profit where a price cutting situation must be faced.

That most manufacturers when confronted with this proposition do not already know their product costs, was recently disclosed in a survey among the members of the National Association of Manufacturers. Of the hundreds of firms who contributed information to this survey, less than 50% knew their costs with sufficient accuracy to direct intelligently their sales policy. As companies contributing to such surveys always represent the more progressive element, this fact discloses an urgent need in industry to further develop one of the primary working tools of profitable operation and an effective weapon against unintelligent price cutting.

It is because of the confusion existing among many manufacturers with regard to the depressed price level problem that I have attempted to show how it came about and its sustaining causes. It has nothing to do with legitimate price reductions based upon large volume of business, such as that accruing from chain syndicates. It has nothing to do with over-production, over-capacity, or supply and demand. It is due, in those industries that have arrived at the fifth stage of competition, almost entirely to the illusion that greater profits can accrue from an increase in volume based on price cutting. Once this illusion is destroyed, the root of the depressed price level problem is also exterminated.

Growing Movement of Limestone on Lakes

THE annual report of the Lake Carriers' Association, in a chapter relative to the limestone trade on the Great Lakes, gives the information that this is the only one of the major commodities of lake commerce that has been progressively record-breaking through a period of several years. The movement of stone in 1929 completed a chain of five consecutive years of peak shipments down the lakes, the report says. The total of limestone moved last season was 16,269,612 net tons, an increase of 592,061 net tons over the preceding season and a net gain of 2,336,236 tons over the 1927 record.

Since 1915, when the stone trade reached proportions that made it an influential factor in the bulk freight trade, there have been only three seasons, 1919, 1921 and 1924, when shipments did not surpass those of the preceding year.

New uses for stone have caused a demand increasingly progressive since 1915. In addition to the large volume of flux stone carried by the bulk freighters, the stone trade has expanded to the extent that besides the three fleets of twelve self-unloading steamers expressly built for the rapid and economic handling of this commodity, ten bulk freighters have been converted into self-unloaders to meet the growing requirements of limestone. In 1915 the total stone carried down the lakes was 3,854,106 net tons, as against for the season of 1929 a total of 16,269,612 net tons.

First Aid Fire Appliances

REGULATIONS of the National Board of Fire Underwriters for the installation, maintenance and use of first aid fire appliances, based on recommendations of the National Fire Protection Association, have been compiled in a handy little booklet.

States to Spend More for Highways in 1930

CO-OPERATING with President Hoover in his plea to enlarge all construction programs as much as is practicable to ameliorate the unemployment situation, the states and their counties will spend in their road building programs for 1930 at least $250,000,000 more than they spent in 1929.

Reports received from state highway departments and compiled by the Bureau of Roads, U. S. Department of Agriculture, show that state and local authorities plan to spend $1,601,167,455 for highway improvement in 1930.

The planned expenditure by state highway departments for construction and maintenance of state highways is $937,500,455; the balance, $663,667,000, will be spent, according to the estimates, on local roads and bridges. The state highway officials of 45 states estimate the total length of roads to be improved by them in 1930 as 32,532 miles, an increase of 3126 miles over the estimate in the 1929 programs. Three states failed to report contemplated mileages for 1930.

The highway departments of all states will control the maintenance of 281,393 miles of highways this year, an increase of 32,381 over the mileage under state maintenance in 1929. Gradually, the states are taking over into their systems for maintenance the more important county and local roads of the country.

The states of greatest population and industrialization in which unemployment, naturally, is greatest, show the highest contemplated expenditures. The middle Atlantic states, comprising New York, New Jersey and Pennsylvania, plan to spend $374,835,310 on improvement of state and local roads; the east north central states of Ohio, Indiana, Illinois, Michigan and Wisconsin plan to spend $303,696,000.

The west north central states, including Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas, rank third in their contemplated expenditure of $236,461,727, and the south Atlantic states of Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia and Florida, with an expenditure of $182,872,418, rank fourth; the west south central states of Arkansas, Louisiana, Oklahoma and Texas rank fifth with an expenditure of $154,100,000; and the Pacific states comprising Washington, Oregon and California rank sixth with an expenditure of $121,590,000.

Kentucky, Tennessee, Alabama and Mississippi, making up the east south central group, plan to spend $101,992,000 on state and local road improvement; Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut in the New England group plan to spend $75,430,000; and the mountain states of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah and Nevada $50,190,000.

Your 1930 Business; Where Is It Coming From; and How?

Part II of a Series of Editorial Discussions That Are Showing a Tendency to Become Irregular!

IN the initial article (or editorial) of this series in the January 18 issue, the editor promised a discussion of kinds and sources of statistics available to producers for possible budgeting of production and sales. What was in the writer's mind then were statistics of building permits, contracts let, etc.; and considerable data has been assembled for such a discussion. But, in considering the value of statistics for predicting and estimating probable business and profits, we ought certainly, first of all, to consider the cost statistics of one's own business.

Necessity for Knowing Costs

We should hesitate to argue the vital necessity of accurate and honest cost-keeping to the success of any business, in the pages of ROCK PRODUCTS, did we not have ample evidence that even in these enlightened industries there is still a woeful lack of such cost-keeping. The president of one of the larger cement companies has assured us that, in his opinion, many portland cement manufacturers still do not know the actual costs of *doing business*—not merely the ordinary costs of production, sales and overhead, but *all* costs between quarrying and preparation of the raw materials and the time the bill for the finished product is collected.

> #### *Just a Moment—*
>
> ***IN ANY LINE of business there are certain men who live on the fringe of ethics. They are not just square, and yet they are not just "not" square. They're hard to classify. They find joy in injuring a competitor even when it profits them nothing; they triumph in being smart enough to evade trade customs that were planned to protect their own interests. Civilization has made wonderful progress, we are becoming more ethical all the time, but we must steel ourselves constantly against the temptation to scuttle the ship that makes our voyage possible.—G. B. B.***

In his remarkably clear and comprehensive analysis of the causes of unfair competition, L. V. Alden on another page of this issue states from unquestionable authority that lack of adequate cost-keeping is still a fundamental cause of bad business conditions in all lines of industry. Without such fundamental statistics as the costs of producing and marketing his materials no producer can hope to make use of any other statistics tending to put his own business on a profitable basis, and his industry on a decent plane of competition.

Uniform Cost-Keeping

To our mind any industry that adopts or attempts to adopt a code of fair business practice, or a code of ethics, *before* it has adopted uniform cost-keeping, puts the cart before the horse, and will make corresponding progress toward the elimination of unfair business practices. The whole essence of business codes is aimed directly or indirectly at unfair price-cutting. It is obvious that one can not know whether a price is fair or unfair unless he knows his costs, nor can his competitors judge the fairness or unfairness of his prices unless they have faith in his knowledge of his costs.

There is little or no excuse for an industry's failure to adopt a uniform method of cost-keeping, which almost anyone will agree is the first step toward lifting an industry out of the mire of disastrous competition. It is absolutely useless to even talk about "selling below cost" if the competing producers are not keeping accurate and honests costs on a comparable basis.

The failure of any industry to act upon or to adopt uniform cost accounting methods is almost invariably caused by the same kind of human perversity that keeps competitors from other helpful co-operative measures. Usually some few members of an industry have well developed cost systems — pet ones that have been many years developing — to which they are so wedded that they would either thrust these unchanged on the industry as a whole, or refuse to accept any other system suggested by the industry as not so good as their own. Their influence is all important. Of course, the answer is that, as in every other co-operative measure, one must give and take for the good of the whole, at the sacrifice of many a pet idea, and often at the sacrifice of his own best judgment. The larger organizations which have well developed cost systems should be willing to change them if in doing so they are aiding other members of the industry in acquiring an education in cost-keeping.

Advantages of Uniform Cost-Keeping

Few trade association activities have been more thoroughly enquired into and passed upon than uniform cost-keeping. It is accepted by economists, if not yet by many producers, that the same kind of advantages that come from standardization of processes and machinery in an industry come also from standardized methods of cost-keeping. These advantages have been admirably summarized by Benjamin S. Kirsh* as follows:

* "Trade Associations—The Legal Aspects," Central Book Co., New York, 1928.

(*a*) Provides "the best way" to figure costs, thereby eliminating expensive experimentation within industry.

(*b*) Results in a better informed competition.

(*c*) Enables industry instantly to place facts before regulatory bodies.

(*d*) Inspires confidence in public, that selling price is the lowest consistent with a full knowledge of cost.

(*e*) Tends to convince manufacturers of the desirability of adopting the plan by showing its successful use by competitors.

(*f*) Reveals lines of individual products marketed heretofore on unprofitable basis.

(*g*) Provides the valuable features of cost accounting generally, among which are:

1. Shows danger line below which products sold cannot bring profit; thus insuring profits.
2. Guide to value, efficiency, and waste of workers, machines, methods, operations, and entire plants.
3. Reliable guide for estimating cost of prospective business.
4. Furnishes current reports for comparing major cost items with predetermined standards, thereby measuring and increasing operating efficiency.
5. Establishes manual of accounting practice, so that a new cost clerk, bookkeeper or accountant will find a fully developed system in operation.

The trouble with uniform cost accounting systems in the eyes of the average small or moderate sized producer is that they are too complicated and cumbersome for his own use. Such should not be the case with a system carefully planned for an entire industry. Such a system could be divided or grouped into ten or a dozen major items of cost which would fit the smallest operation. These major items may then be subdivided into as many more as any individual operator chooses for his own purpose. But his summaries under the major items would be comparable with the costs of the operator who chose to use these only.

There is no legal obstacle to the dissemination and discussion of costs by trade associations, and great good can come to an industry as a whole from such discussion. There can be no agreement on items of cost, such as a uniform charge for depletion, because this is in effect establishing by agreement a part of the price, which is contrary to the anti-trust laws. But, barring this use of costs to directly establish a uniform price, there is probably nothing an industry can do that makes more effectively for a stabilized, healthful condition than the adoption of uniform cost accounting and freely comparing and discussing costs. Of course, every producer must exercise his own initiative and judgment in using his cost statistics to fix his own cost and his selling price; but it is obviously a great advantage to him and to his industry to know that his competitors know how to keep costs, and do keep costs in such a way that they are comparable to his.

So before we continue a discussion of statistics and their use in eliminating some of the uncertainties of business, let it be emphasized again that the most important of all statistics are one's own cost figures. It is understood that two of the national associations in the aggregate industry now have committees at work to develop uniform cost-keeping methods. There is no apparent reason why the two systems should not be much the same in essentials. The day is coming when cost comparisons between the industries will be important to the welfare of both.

Convict Competition

For some unknown reason the rock products industries appeal to public authorities as popular fields to exploit with convict labor. We presume the reason is partly an historical one, for convicts have been sent to work "on the rock pile" from time immemorial—long before the introduction of mechanical rock crushing and present elaborate and costly installations for quarrying, crushing and screening stone. Also, of course, crushed stone, cement, etc., are commodities ordinarily purchased in considerable amounts by public authorities.

There are already a state portland cement plant, at least one lime plant and numerous quarries and crushing plants operated by convict labor. State cement plants to be operated by convict labor are right now being actively promoted in West Virginia, Mississippi, Arizona and every now and then in Oklahoma, Texas and other states. The state of Illinois is proposing to spend half a million dollars of highway funds to build a crushed-stone plant at one of its state prisons.

Obviously the matter is a serious one with practically every producer of rock products, directly or indirectly. The problem of employment of prison labor, with the constantly growing prison population, is indeed a serious one also, not only with the prison authorities but with the public itself, of which the producers in the rock products industries are no inconsiderable part, their economic importance as a 750 million dollar a year industry taken into account.

It has been proved beyond question of doubt, all factors taken into consideration, that prison labor is never really profitable in any line of industry. The problem is to give prisoners something to do, for idle prisoners are a menace to society as well as to the prison authorities. Consequently something should be found to employ the *largest* possible number. All modern industrial operations are designed to employ the *least* possible number of unskilled laborers—and this is just as true of the rock products industries as it is of automobile manufacture. Hence, employment of prisoners in modern cement and crushed-stone plants defeats the primary object of prison employment. And except for the employment of prisoners no one has adequate ground for advocating state-operated producing or manufacturing operations of any kind.

Moreover, the purpose of prison and "hard labor" is punishment for crimes committed, and it is no more punishment to work in a modern cement mill or crushing plant than in an automobile factory. Labor on the rock pile, whether it is hard labor or not, carries a stigma that makes it punishment as well as employment. If you bear these facts in mind, the resolution adopted by the National Crushed Stone Association at its recent Cincinnati convention, recommending prisoners be employed "breaking stone with hammers," is philosophically and economically sound.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	3-22-30	85		
Alpha P. C. new com.	3-24-30	35	36¾	75c qu. Apr. 15
Alpha P. C. pfd.	3-22-30	110		1.75 qu. Mar. 15
American Aggregates com.[29]	3-22-30	20	25	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	3-26-30	85		
American Brick Co., sand-lime brick	3-25-30	5		25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	12-13-29		80	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]†	3-22-30	94		
American Silica Corp. 6½'s[49]	3-25-30	No market		
Arundel Corp. new com.	3-24-30	45¼	45½	75c qu. Apr. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	3-25-30	No market		
Beaver P. C. 1st 7's[20]	1-10-30		100	
Bessemer L. & C. Class A[4]	3-24-30	30½	32½	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	3-24-30	89	92	
Bloomington Limestone 6's[20]	3-22-30	82	86	
Boston S. & G. new com.[47]	3-22-30	16	20	40c qu. Jan. 1
Boston S. G. new 7% pfd.[47]	3-22-30	46	50	87½c qu. Jan. 1
California Art Tile A	3-20-30	9	12¼	43¾c qu. Mar. 31
California Art Tile B	3-20-30	4¾	7¼	20c qu. Mar. 31
Calaveras Cement 7% pfd.	3-20-30	88	89	1.75 qu. Apr. 15
Calaveras Cement com.	3-20-30	14¾	15	
Canada Cem. com.	3-24-30	17¾	18	
Canada Cement pfd.	3-24-30	93½	95	1.62½c qu. Mar. 31
Canada Cem. 5½'s[43]	3-21-30	99¼	100	
Canada Cr. St. Corp. bonds[43]	3-21-30	96		
Certainteed Prod. com.	3-24-30	13¼	13½	
Certainteed Prod. pfd.	3-24-30	35	50	1.75 qu. Jan. 1
Cleveland Quarries	3-24-30		67	75c qu. 25c ex Mar. 1
Columbia S. & G. pfd.	3-25-30	91½	100	
Consol. Cement 1st 6½'s, A	3-25-30	80	90	
Consol. Cement 6½% notes[24]	3-26-30	70	80	
Consol. Cement. pfd.[29]	3-22-30	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	3-21-30	101		
Consol. Rock Prod. com.[5]	3-20-30	2½	5	
Consol. Rock Prod. pfd.[5]	3-20-30	22½	25	
Consol. S. & G. com. (Can.)[38]	2- 8-30	No market		
Consol. S. & G. pfd. (Can.)	3-24-30	85		1.75 qu. Feb. 15
Construction Mat. com.	3-24-30	20¼	21⅝	
Construction Mat. pfd.	3-24-30	42½	43	87½c qu. Feb. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	3-22-30	90	95	
Coosa P. C. 1st 6's[29]	3-22-30	50	60	
Coplay Cem. Mfg. 1st 6's[40]	3-22-30	90		
Coplay Cem. Mfg. com.[40]	3-22-30	10		
Coplay Cem. Mfg. pfd.[40]	3-22-30	70		
Dewey P. C. 6's (1942)	3-25-30	96		
Dewey P. C. 6's (1930)	3-25-30	96		
Dewey P. C. 6's (1931-41)	3-25-30	96		
Dolese & Shepard	3-24-30	81	83	$2 qu. Apr. 1
Edison P. C. com.[39]	3-22-30	10c		
Edison P. C. pfd.[39]	3-22-30	25c		
Giant P. C. com.[2]	3-22-30	10	16	
Giant P. C. pfd.[2]	3-22-30	25	35	
Gyp. Lime & Alabastine Ltd.	3-24-30	23	23¼	37½c qu. Apr. 1
Hermitage Cement com.[11]	3-22-30	20	25	
Hermitage Cement pfd.[11]	3-22-30	80	90	
Hermitage Cement 6's[11]	3- 8-30	101	104	
Ideal Cement, new com.	3-24-30	55	58	75c qu. Apr. 1
Ideal Cement 5's, 1943[33]	3-24-30	96½	99½	
Indiana Limestone com.[29]	3-22-30	1	3	
Indiana Limestone pfd.[29]	3-22-30	No market		1¾% qu. Mar. 1
Indiana Limestone 6's	3-24-30	73½	74	
International Cem. com.	3-24-30	71	71½	$1 qu. Mar. 28
International Cem. bonds 5's	3-24-30	100¼	100½	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	1-24-30	80		
Kelley Is. L. & T. new st'k	3-24-30	44⅞	45⅛	62½c qu. Apr. 1
Ky. Cons. St. com. V. T. C.[48]	3-22-30	11	13	
Ky. Cons. Stone 6½'s[48]	3-22-30	94	98	
Ky. Cons. Stone pfd.[48]	3-22-30	89	91	
Ky. Cons. Stone com.[48]	3-22-30	11	13	
Ky. Rock Asphalt com.[11]	3-22-30	17	20	40c qu. Apr. 1
Ky. Rock Asphalt pfd.[11]	3-22-30	80	85	1:75 qu. Mar. 1
Ky. Rock Asphalt 6½'s[11]	3-22-30	90	100	
Lawrence P. C.	3-22-30	50	60	$1 qu. Mar. 29
Lawrence P. C. 5½'s, 1942	2- 5-30	84	90	
Lehigh P. C.	3-24-30	39½	40½	62½c qu. May 1
Lehigh P. C. pfd.	3-22-30	104	108	1¾% qu. Apr. 1
Louisville Cement[48]	3-24-30	250		
Lyman-Richey 1st 6's, 1932[13]	3-22-30	97	99	
Lyman-Richey 1st 6's, 1935[13]	3-22-30	97	99	
Marblehead Lime 6's[14]	3-22-30	94	98	
Marbelite Corp. com.	3-20-30	310		
Marbelite Corp. pfd.	3-20-30	13		50c qu. Apr. 10
Material Service Corp.	3-26-30	21	23	50c qu. Mar. 1
Medusa Portland Cem.	3-24-30		100	1.50 Jan. 1
Mich. L. & C. com.[6]	3-22-30	30		
Missouri P. C.	3-24-30	34	34½	50c qu. Feb. 1
Monolith Portland Midwest[9]	3-20-30	4	5	
Monolith bonds, 6's[9]	1- 9-30	97½	100	
Monolith P. C. com.[9]	3-20-30	7	8	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	3-20-30	7	8	40c s.-a. Jan. 1
Monolith P. C. units[9]	3-20-30	21	24	
National Cem. (Can.) 1st 7's[43]	3-21-30	99½		
National Gypsum A com.	3-24-30	4	6	
National Gypsum pfd.	3-24-30	34	38	
Nazareth Cem. com.[26]	3- 7-30	20	23	
Nazareth Cem. pfd.[26]	3- 7-30	100	103	
Newaygo P. C. 1st 6½'s[29]	3-22-30	101½		
New Eng. Lime 1st 6's[14]	3-22-30	90	95	
N. Y. Trap Rock 1st 6's	3-24-30	99½	100	
N. Y. Trap Rock 7% pfd.[36]	3-21-30	95		
North Amer. Cem. 1st 6½'s	3-24-30	65	66	
North Amer. Cem. com.	3-22-30	3⅞		
North Amer. Cem. 7% pfd.[29]	3-22-30	23	27	
North Amer. Cem. units[29]	3-22-30	27	34	
North Shore Mat. 1st 5's[15]	3-25-30	95		
Northwestern States P. C.[37]	3- 8-30	130		$2 Jan. 1
Ohio River Sand com.	3-24-30	19	20	
Ohio River Sand 7% pfd.	3-24-30	98½	102	
Ohio River S. & G. 6's[16]	3-22-30	85	95	
Pacific Coast Cem. 6's[5]	3-20-30	80	85	
Pacific P. C. com.	3-20-30	29	29¾	
Pacific P.C., new pfd.	3-20-30	77	84	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	3-20-30	99¼		
Peerless Cem. com.[21]	3-22-30	8	10	
Peerless Cem. pfd.[21]	3-22-30	80	85	1.75 Dec. 31
Penn-Dixie Cem. pfd.	3-24-30	45	54	
Penn-Dixie Cem.com.	3-24-30	10¼	10½	
Penn-Dixie Cem. 6's	3-22-30	81		
Penn. Glass Sand Corp. 6's	3- 5-30	99	100	
Penn. Glass Sand pfd.	3- 5-30	100		1.75 qu. Jan. 1
Petoskey P. C.	3-24-30	8¼	9	15c qu. Dec. 31
Port Stockton Cem., units[9]	2-17-30		30	
Port Stockton Cem. com.[9]	3-20-30		1	
Riverside Cement com.	3-20-30	15		
Riverside Cement pfd.[9]	3-20-30	78	82	
Riverside Cement, A[9]	3-20-30		16	31¼c Feb. 1
Riverside Cement, B[9]	3-20-30	4	5	
Roquemore Gravel 6½'s[17]	3-22-30	99	100	
Santa Cruz P.C. 1st 6's, 1945[5]	3-20-30	105¾		6% annually
Santa Cruz P. C. com.	3-20-30	92		$1 qu. Apr. 1
Schumacher Wallboard com.	3-20-30	11½	14	
Schumacher Wallboard pfd.	3-20-30	23	24½	50c qu. Feb. 15
Southwestern P. C. units[14]	3-21-30	245		
Standard Paving & Mat. (Can.) com.	3-24-30	23½	24	50c qu. Feb. 15
Standard Pav. & Mat. pfd.	3-24-30		89	1.75 qu. Feb. 15
Superior P. C., A	3-20-30	39	39⅞	27½c mo. Apr. 1
Superior P. C., B	3-20-30	12	12½	25c qu. Mar. 20
Trinity P. C. units[37]	3- 8-30	135	145	
Trinity P. C. com.[37]	3- 8-30	50		
Trinity P. C. pfd.[29]	3-22-30	100	110	
U. S. Gypsum com.	3-24-30	47½	48	40c qu. Mar. 31
U. S. Gypsum pfd.[29]	3-22-30	118	125	1.75 qu. Mar. 31
Universal G. & L. com.[3]	3-25-30	75c		
Universal G. & L. pfd.[3]	3-25-30	8	10	
Universal G. & L., V.T.C.[3]	3-25-30	No market		
Universal G. &L. 1st 6's[3]	3-25-30	No market		
Warner Co. com.[16]	3-22-30	48¼	49	50c qu. Apr. 15
Warner Co. 1st 7% pfd.[16]	3-22-30	101	104	1.75 qu. Apr. 1
Warner Co. 1st 6's[8]‡	3-25-30	99	100	
Whitehall Cem. Mfg. com.[36]	3-21-30	40		
Whitehall Cem. Mfg. pfd.[36]	3-21-30	48		
Wisconsin L. & C. 1st 6's[15]	3-25-30	95		
Wolverine P. C. com.	3-24-30	5	5½	15c qu. Feb. 15
Yosemite P. C., A com.[9]	3-20-30	2¾	3¼	

†$40,189 called for redemption at 106, Feb. 26, 1930. ‡$105,000 called for redemption at 105, Feb. 25, 1930.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler Beadling & Co., Youngstown, Ohio. [5]Freeman, Smith & Camp Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simons & Co., Inc., Detroit, Mich. [22]Hemphill, Noyes & Co., New York, N. Y. [24]A. B. Leach & Co., Inc., Chicago, Ill. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [28]Bank of Republic, Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago, Ill. [33]Boettcher Newton & Co., Denver, Colo. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Quebec. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Wise, Hobbs & Arnold, Boston. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co., Chicago, Ill.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Atlantic Gypsum Products Co. 6's, 1941, $4,000 and 40 shs. com.[1]	35%	
Atlantic Gypsum Products 6's, 1941, $5,000; 50 shs. com. as bonus[3]	49%	
Consolidated Cem. com. v.t.c., 3220 shs.[1]	1½ per share	
Indiana Limestone deb. 7's, 1936, wtih warrants ($1,000)[4]	$500 for the lot	
Universal Gypsum com. trust ctfs., 800 shs.[2] (no par)	$5 for the lot	
Universal Gypsum com., 300 shs.[2] (no par)	$6 for the lot	

[1]Price at auction by Wise, Hobbs & Arnold, Boston, Dec. 18, 1929. [2]Price at auction by Adrian H. Muller & Son, New York, Dec. 18, 1929. [3]Price at auction by R. L. Day & Co., Boston, Dec. 18, 1929. [4]Price at auction by Adrian H. Muller & Son, Dec. 26, 1929.

Pacific Coast Aggregates Earnings

THE ANNUAL REPORT of the president to the stockholders of the Pacific Coast Aggregates, Inc., reveals a net income, excluding depreciation, depletion and amortization of bond discount, of $318,703, earned since organization September 1, 1929, to January 1.

Commenting on past operations and future outlook for the company, N. B. Livermore, president, said:

"The retail distribution of rock, sand and gravel has been rather light during the period of operations under review. This is partly due to the general depression in building activity and partly from competition of ready mixed concrete which has been used on many building jobs in our territory.

"The price situation is rapidly assuming a more satisfactory character. The amount of low priced contracts inherited from the predecessor companies which still have to be filled as a matter of obligation or policy has been definitely determined and the average price received for the commodities produced by the company soon will be practically up to normal.

"The company commenced operations September 1, 1929. January 1, 1930, there were operating six producing plants continuously, and seven plants intermittently, and there were operating all or part time, 15 distributing plants. Three distributing plants have been leased to other dealers under short term leases.

"Up to January 1, 1930, the company has produced, in round numbers, 1,140,000 tons of rock, sand and gravel, approximately 70% of this being rock and gravel and 30% sand. During the same period the total tonnage sold has been 1,228,600 tons, the difference between this figure and the production having come from outside purchases and from stock turned over by the predecessor companies.

"The total sales of building material to January 1 amounted to $786,900; the total sales of fuel to $105,400. The total tonnage of rock, gravel and sand sold through the distributing plants amounted to 191,300 tons. The amount of orders for rock, sand and gravel booked but not shipped on January 1 was 777,000 tons.

"The above figures for total tonnage shipped are somewhat greater than anticipated. The tonnage booked but not shipped is fairly satisfactory in amount. The business is a seasonal one and the corresponding profits during the winter months are very much less than during the late spring, summer and fall months.

"As to financial condition, the company is in a strong cash position. As of January 1, current assets totaled $1,829,163, from which have been deducted $31,123 as a credit to the depletion fund, leaving net current assets, after this deduction, of $1,798,039, of which $731,263 is in cash or on deposit or has been loaned upon liquid securities. Current liabilities total $586,925. The ratio of current assets to current liabilities is approximately three to one.

"The general outlook for business during the coming year, subject to weather conditions and underlying causes of which the management has no control, is believed to be satisfactory, and the company is looking forward to securing a good volume of business at fair prices during 1930."

The consolidated balance sheet, as of December 31, 1929, follows:

ASSETS	
Cash on hand and on deposit	$ 731,263
Customers accounts	523,919
Other accounts	21,956
Inventories	425,809
Material and supplies	126,214
Total current assets	1,829,163
Less depletion fund	31,123
Net current assets	1,798,039
Deposit lands and rights	13,367,521
Other lands	354,754
Buildings, machinery and equipment (net)	4,930,728
Contracts	1
Investments	42,739
Prepaid expense and deferred charges	749,391
Total assets	$21,243,175
LIABILITIES	
Current liabilities	$ 586,925
Equity of Natomas Co. in Coast Rock and Gravel Co., net assets	244,627
Deferred income credits	3,363
First mortgage 6½% bonds	4,000,000
Ten-year 7% convertible debentures	1,500,000
Capital and surplus	14,908,259
Total liabilities	$21,243,175

British Cement Company Profits

THE Britport Cement Co. trading profit for the year was £721,859 against £722,412. After providing for debts and allocating £355,000 to reserve, a balance of £337,817 was shown. A dividend of 15% on the ordinary shares was declared.

International Cement Earnings

CONSOLIDATED profit and loss statement of the International Cement Corp., New York City, and subsidiary companies, giving the results of the fourth quarter of 1929, as compared with the results for the first, second and third quarters of 1929, are as follows:

Summarizing, for the year ended December 31, 1929, preliminary consolidated net income of $4,909,232 after expenses, interest, depreciation and reserves for federal taxes and contingencies, equal to $7.82 a share on the 627,865 no par common capital shares outstanding. This compares with $5,129,284 in 1928, equal after dividends on the preferred stock retired May 20, 1928, to $7.87 a share on the 618,826 common shares then outstanding.

Consolidated net income for the quarter ended December 31, 1929, including credit reserves for federal taxes and contingencies, amounted to $1,381,467 or $2.20 a share on the outstanding common capital shares. This compares with $1,360,356 in the preceding quarter or $2.20 a share on the 619,049 common capital shares then outstanding, and with $1,514,909 in the corresponding quarter of 1928 or $2.44 a share on the 618,826 no par common capital shares then outstanding.

CONSOLIDATED PROFIT AND LOSS STATEMENT FOR 1929, INTERNATIONAL CEMENT CORP.

	1929 4th quarter	3rd quarter	2nd quarter	1st quarter
Gross sales	$8,490,541.74	$10,377,104.09	$9,061,788.78	$7,491,036.14
Less: Packages, discounts and allowances	1,722,487.31	2,166,606.09	1,848,661.39	1,533,810.81
Net sales	$6,768,054.43	$8,210,498.00	$7,213,127.39	$5,957,225.33
Manufacturing cost, excluding depreciation	$3,473,704.86	$4,085,502.60	$3,650,912.20	$2,923,110.72
Depreciation	742,182.44	863,371.23	622,914.24	446,368.58
	$4,215,887.30	$4,948,873.83	$4,273,826.44	$3,369,479.30
Manufacturing profit	$2,552,167.13	$3,261,624.17	$2,939,300.95	$2,587,746.03
Shipping, selling and administrative expenses	1,368,026.71	1,410,425.67	1,311,174.76	1,173,899.61
Net profit	$1,184,140.42	$1,851,198.50	$1,628,126.19	$1,413,846.42
Less: Interest charges and financial expenses	170,270.09	174,240.52	189,114.49	147,722.06
	$1,013,780.33	$1,676,957.98	$1,439,011.70	$1,266,124.36
Reserves for federal taxes and contingencies	*367,597.30	316,601.81	289,222.88	248,504.77
Net to surplus	$1,381,467.63	$1,360,356.17	$1,149,788.82	$1,017,619.59

*Gain.

Superior Portland Cement Co.'s Balance Sheet

THE balance sheet of Superior Portland Cement Co., as of December 31, 1929, compares as follows with the preceding year:

Assets—	1929	1928
Real, plant, etc.	$5,404,214	$5,574,770
Investments	673,772	771,983
Inventories	333,993	310,257
Accounts and notes rec.	77,801	110,990
Cash	77,294	91,338
Deferred assets	168,103	149,369
Total	$6,735,177	$7,008,707
Liabilities—		
Capital and surplus	$6,531,253	$6,735,320
Acct. and note payment	59,271	52,004
Payrolls	13,081	22,695
Reserve for taxes	80,182	192,314
Other reserve	51,390	5,374
Total	$6,735,177	$7,008,707

The annual report of E. P. Lucas, president, states:

"Sales for the year 1929 were satisfactory when all conditions of the volume of business offered are considered. Latest government figures show that cement sales in Washington were 16% under that in 1928—a decrease caused by a decided decline in the building program and a curtailment of both

highway and street paving. In addition to these factors, two new cement plants entered into business in western Washington, one in 1928 and one in 1929.

"In spite of this adverse combination, earnings per barrel were comparable to those of preceding years.

"Adequate provision has been made for depreciation and depletion.

"During the year betterments were made in the kiln room, giving more flexible control of the clinker burning. Development continued at the Lang quarry. Improvements of this character help make cement of a higher and more uniform quality, and tend to decrease manufacturing costs.

"The policy of purchasing class "A" preferred stock in the open market for cancellation, continued throughout the year."

McCrady-Rodgers Preferred Stock Offered

PEOPLES-Pittsburgh Trust Co., Pittsburgh, Penn., are offering $650,000 McCrady-Rodgers Co. 7% cumulative convertible preferred stock, $50 par value, at $49.25 per share to yield 7.1%. The stock is convertible at its par value into no par common stock of the company at any time prior to January 1, 1935, as follows: At $22 per share during 1930, at $24 per share during 1931, at $26 per share during 1932, at $28 per share during 1933, at $30 per share during 1934.

The following is taken from a joint letter of W. F. McCrady, chairman of the board, and W. B. Rodgers, president, McCrady-Rodgers Co.:

History and Business—McCrady-Rodgers Co. has been organized under the laws of Pennsylvania and acquired the assets and business of McCrady Brothers Co. and of Rodgers Sand Co. McCrady-Rodgers Co. will continue and develop the established business of these two companies. The predecessor companies have been long established, McCrady Brothers Co. having been founded by J. H. McCrady in 1870, to engage in the general builders' supply business, and Rodgers Sand Co. was incorporated in 1900 by Capt. William B. Rodgers for the production of river sand and gravel. McCrady-Rodgers Co. is the largest company in the Pittsburgh district supplying sand, gravel and builders' supplies. Through its wharves, storage and other facilities for distribution the company will supply a large consuming trade with sand, gravel and all kinds of building materials.

Capitalization—The capitalization of McCrady-Rodgers Co. is as follows:

	Authorized	Outstand'g
First mortgage 6% convertible sinking fund gold bonds	$650,000	$650,000
7% cumulative convertible preferred stock, $50 par	650,000	650,000
Common stock, no par, shares	250,000*	144,353

*Of this amount a sufficient number of shares has been reserved to take care of the conversion privileges on the first mortgage bonds and the 7% preferred stock.

Assets—McCrady-Rodgers Co. has a total of 19 properties strategically located throughout the Pittsburgh district and completely equipped for the preparation and distribution of sand and gravel, and for the warehousing, preparation, loading and distribution of all kinds of building materials. The company's properties have advantageous rail or river connections. Equipment at the yards includes cranes, derricks and other machinery for the mechanical handling of materials. Elevated bins permit of direct loading to trucks for retail distribution. The company has a cement block plant whose product is well and widely known, a modernly equipped planing mill and a "transit-mixed" truck fleet which enables it to make quick and economical deliveries of concrete to any point in Allegheny county. The company's river equipment, such as towboats, dredges, barges, derricks, etc., is modern and complete.

Earnings—The consolidated earnings of the predecessor companies for five years and eight months ending August 31, 1929, and for McCrady-Rodgers Co. for four months ending December 31, 1929 (December estimated), after depreciation, interest and federal income tax, adjusted to the present rate of 11% per annum, were as follows: 1924, $289,905; 1925, $461,544; 1926, $367,850; 1927, $231,798; 1928, $298,697; 1929 (December estimated), $329,279.

Average net earnings for the six year period were $329,845, or over 7.2 times the dividend requirements on this issue, after depreciation, deduction of interest on the first mortgage bonds and federal taxes. After these charges and preferred stock dividends, there was earned on the outstanding common stock an average of $1.97 per share over the six year period. It is believed by the management that the combining of the two companies should result in increased profits through the elimination of duplicate facilities and through economies in the operation of the combined businesses under one management.

Purpose of Issue—McCrady-Rodgers Co. purchased the assets of McCrady Brothers Co. and Rodgers Sand Co. in part with cash and in part with securities of the new company. The proceeds of this financing will supply a portion of the funds required.

Balance Sheet, as of November 30, 1929 (giving effect to sale of $650,000 first 6s and $650,000 7% preferred stock).

McCRADY-RODGERS CO. BALANCE SHEET

ASSETS	
Property and equipment	$2,630,438
Investments	26,648
Cash	391,052
Notes and accounts receivable (net)	784,517
Certificates of indebtedness	28,761
Cost of uncompleted contracts (net)	236,220
Inventories	236,276
Deferred charges	69,805
Total	$4,403,717
LIABILITIES	
Preferred stock	$ 650,000
Common stock*	721,765
Bonded debt	650,000
Accounts payable	209,087
General taxes, etc., accrued	11,703
Federal income tax	34,128
Surplus	2,127,034
Total	$4,403,717

*Represented by 144,353 no par shares.

Consolidated Oka Earnings

EARNINGS of $2.30 a share on outstanding common stock are shown by Consolidated Oka Sand & Gravel Co., Ltd., for the fiscal year ended December 31, 1929, the initial operating period of the company since the merger. The income account shows an operating profit for the year of $202,884 from which the following deductions are made: Bond interest, $45,500; depreciation, $37,815; organization expenses, $2,246; sinking fund, $2,333; bad debts, $4,384; special depreciation on barges, $10,000; discounts and claims, $3,100. This left $97,605 applicable to preferred stock, and after dividends on the senior issue of $49,252, $48,353 was available for the 21,000 shares of common stock outstanding. This sum, carried into surplus, with the $2,638 brought forward, left a balance sheet surplus of $50,990.

In the balance sheet, current assets are shown at $224,772, and current liabilities at $101,657, leaving net working capital of $123,115. Current assets are composed of cash in hand, $3,481; accounts receivable, $68,089; bills receivable, $12,400; inventories, $98,682; prepayments, $36,403; and insurance claims, $5,538. Current liabilities are made up of payables, $81,794, and accruals, $19,863.

Total assets are shown at $1,930,665. The fixed assets of $1,701,399 comprising fleet, $838,400; plant and equipment, $772,024; mining rights and leases, $143,000. Capital liabilities are as follows: Funded debt, $700,000; preferred stock, $701,700; and common stock, $370,884. Surplus is carried at $50,990; reserve for discount and claims, $3,100; sinking fund reserves, $2,333; and depreciation reserves, $53,945.

Total sales for 1929 amounted to $778,870.

Coronet Phosphate Co. Income Account

COMPARATIVE income account and balance sheet of the Coronet Phosphate Co., New York City, for 1929 and 1928 is as follows:

CORONET PHOSPHATE CO. INCOME ACCOUNT

	1929—Dec. 31—	1928
Gross revenue	$1,226,623	$1,180,182
Operating expense, etc.	867,301	820,352
Depreciation and depletion	190,043	170,135
Operating income	169,279	189,695
Fixed charges, etc.	23,544	32,022
Federal taxes	13,458	21,904
Net income	132,277	135,769
Dividends	112,500	....
Surplus	$ 19,777	$ 135,769

BALANCE SHEET

Assets:	1929—Dec. 31—	1928
Phosphate lands	$2,193,665	$2,198,884
Plant equipment	1,954,588	2,598,997
Currents assets:		
Inventories	314,977	419,117
Notes receivable	6,490	8,100
Accounts receivable	220,197	170,093
Cash	242,796	437,288
Sinking fund	66,209	28,034
Deferred assets	48,439	63,230
Total	$5,047,361	$5,923,743
Liabilities:		
Capital stock	$2,500,000	$2,500,000
Bonded debt	386,000	418,000
Current liabilities:		
Accounts payable	16,550	26,145
Accruals	11,580	37,540
Federal tax reserve	13,458	21,904
Dividends payable	37,500	....
Reserve for sinking fund	66,084	27,606
Reserve for depreciation, etc.	1,170,352	2,066,489
Surplus	845,836	826,059
Total	$5,047,361	$5,923,743
Current assets	784,460	1,034,598
Current liabilities	145,172	113,195
Working capital	$ 639,288	$ 921,403

North American Cement Company's Report

THE following extracts are from the annual report of F. W. Kelley, president of the North American Cement Corp., Albany, N. Y.:

"Figures published by the U. S. Bureau of Mines show that shipments of portland cement in 1929 into the territory which the plants of the North American company serve, were 3.9% less than in 1928. Shipments of the company decreased somewhat more than this. The continued pressure from foreign cement accentuating the result of a smaller volume of building construction, brought at about mid-season a sharp drop in selling price, so that the average selling price of the company per barrel for the year was about 5% less than in 1928.

"Through the use during the entire year of new facilities, such as the waste-heat boiler plant at Security, and through more efficient handling, the production cost per barrel was reduced over 10% from 1928, notwithstanding the smaller volume of business. Selling and overhead expenses were lower than in 1928, but not enough to reduce the unit cost per barrel in the face of reduced volume of business.

"The increased net profits inadequately represent the enormous effort made and efficient work done to accomplish this result under the extremely difficult conditions of the year.

"The importation of foreign cement, free of duty, has continued to place upon the company the unequal task of trying to make a profit in competition with a wage scale and standards of living much below our own. We have assisted in placing before Congress what the magazine Rock Products said was a perfect case for a protective tariff, judged by the facts and logic on which protective tariffs have been granted other industries."

BALANCE SHEET OF THE NORTH AMERICAN CEMENT CORP.
(December 31, 1929)

ASSETS

Current:		
Cash		$778,979.11
Notes and trade acceptances receivable	$ 25,485.03	
Accounts receivable	271,888.15	
	$297,373.18	
Less allowance for doubtful accounts	39,326.03	258,047.15
Inventories, at the lower of cost or market		1,015,088.77
Total current assets		$2,052,115.03
Real estate, buildings, equipment and stone deposits	$15,934,069.69*	
Less allowance for depreciation and depletion	2,480,971.46	13,453,098.23
Treasury stock and investments, at cost		62,797.75
Sinking fund		584.11
Deferred charges		661,168.22
		$16,229,763.34

LIABILITIES

Current:	
Accounts payable ($240,000 payable at rate of $20,000 per month)	$302,823.45
Accrued interest, wages, etc.	200,466.13
Provision for federal income taxes	32,369.44
Total current liabilities	$535,659.02
Amount due for plant additions, payable $20,000 per month after December 31, 1930	54,000.00
First mortgage 6% bonds, due August 20, 1935, Acme	287,000.00
Sinking fund gold debentures, Series A, 6½%, due September 1, 1930	6,848,500.00
Reserves, insurance and accident, etc.	66,183.32
	$7,791,342.34

CAPITAL

Preferred stock, 7% cumulative, $100 par value, authorized 100,000 shares, issued 51,500 shares (dividends paid to August 1, 1927, and dividends of $1.75 per share paid August 1, 1928, and August 1, 1929)	$5,150,000.00
Common stock, no par value, authorized 350,000 shares, issued 133,250 shares	1,412,500.00
Initial surplus	1,248,685.75
Earned surplus	627,235.25
	$8,438,421.00
	$16,229,763.34

*Commercial value of properties acquired at organization in 1925 as appraised by Ford, Bacon and Davis, Inc., with subsequent acquisitions and additions at cost.

INCOME ACCOUNT
(For the year ended December 31, 1929)

Net sales		$4,863,582.51
Cost of sales, exclusive of depreciation and depletion		2,617,873.67
Gross profit		$2,245,708.84
Selling and other expenses		812,634.76
Net profit		$1,433,074.08
Miscellaneous earnings		26,744.98
Gross earnings		$1,459,819.06
Interest and amortization expenses on bonds	$491,642.26	
Depreciation and depletion	662,513.35	1,154,155.61
		$ 305,663.45
Federal income taxes		23,369.44
Net income		$ 282,294.01

SURPLUS ACCOUNT

Initial and earned surplus, December 31, 1928	$1,609,773.64
Net income for the year 1929	282,294.01
Freight refunds, etc., net, for prior years	72,378.76
Minor adjustments	1,599.59
	$1,966,046.00
Deduct, dividends on preferred stock	90,125.00
Initial and earned surplus, December 31, 1929	$1,875,921.00
Initial surplus	$1,248,685.75
Earned surplus	627,235.25
	$1,875,921.00

Gypsum, Lime and Alabastine, Canada, Ltd., Earnings

GYPSUM, Lime & Alabastine, Canada, Ltd., formerly Canada Gypsum & Alabastine, Ltd., for fiscal year ended December 31, 1929, reports earnings after tax provision and increased write-offs for depreciation and depletion, but before taking into account non-recurring charges, equal to $2.35 a share on average number of shares outstanding (estimated to be 362,000) during year.

Net income, after all charges, including $13,629 premium on debenture redemption, $32,683 interest paid to banks on property purchase pending new financing and $9.309 incorporation expenses, totaled $531,403, equal to $1.47 a share on average number of shares outstanding and to $1.18 a share on 450,786 shares outstanding at end of year. Net income in 1928 was $430,589, or $5.67 a share on 75,933 shares.

Operating profits increased during year to $1,315,315 from $977,591 in 1928, due in part to profits from eight and one-half months operations of newly acquired lime plants in Ontario and from four months operations of plants of Standard Lime Co., of Quebec.

Interest charges were lower, at $174,029, against $210,799, largely brought about by retirement during year, mostly through conversion into common, of $1,000,000 of 6% convertible debentures.

Company made substantial expenditures during year on its various plants, and also deducted from earnings a part of money paid in acquisition of new plants. The company is constructing a gypsum products plant in Calgary, to be completed by April 15.

Sales increased in 1929 over 1928 by 12.75%, and, taking into consideration new plants, by 36.29%. Gain in export sales was 30%.

Balance sheet shows current assets at $2,116,734, against current liabilities of $648,470, leaving working capital of $1,468,264 compared with working capital at end of 1928 of $1,072,291. Surplus is carried at $530,033, against $239,178, and reserves at $525,883, against none year before.—*Wall Street Journal.*

Certain-Teed Products Earnings

CERTAIN-TEED Products consolidated net loss was $1,282,586 for the year ended December 31, 1929, after all charges and adjustments, as compared with a net loss of $426,525 in 1928. For the quarter ended December 31, the net loss was $566,809, after all charges, against a net loss of $50,299 in the preceding quarter and a net loss of $40,998 in the 1928 quarter.

Recent Dividends Announced

Alpha P. C. com. (qu.)	75c	Apr. 15
Arundel Corp. (qu.)	75c	Apr. 1
Calaveras Cement pfd. (qu.)	$1.75	Apr. 15
California Art Tile Class A (qu.)	43¾c	Mar. 31
California Art Tile Class B (qu.)	20c	Mar. 31
Dolese and Shepard (qu.)	$2	Apr. 1
Dufferin Pav. and Crush. Stone, Ltd. 1st pfd. (qu.)	$1.75	Apr. 1
Gypsum Lime and Alabastine (qu.)	37½c	Apr. 1
Ideal Cement com. (qu.)	75c	Apr. 1
Kelley Island L. & T. com. (qu.)	62½c	Apr. 1
Kentucky Rock Asphalt com. (qu.)	40c	Apr. 1
Lawrence P. C. (qu.)	$1	Mar. 29
Lehigh P. C. com. (qu.)	62½c	May 1
Marbelite Corp. pfd. (qu.)	50c	Apr. 10
Santa Cruz P. C. (qu.)	$1	Apr. 1
Superior P. C. Cl. A (mo.)	27½c	Apr. 1
Superior P. C. Cl. B (qu.)	25c	Mar. 20
Warner Co. com. (qu.)	50c	Apr. 15
Warner Co. 1st pfd. (qu.)	$1.75	Apr. 1
Warner Co. 2nd pfd. (qu.)	$1.75	Apr. 1

Foreign Abstracts and Patent Review

Gypsum Rock and Phosphate as Cement Retarders. Dahlgreen worked with a raw gypsum containing 92.50% $CaSO_4 \cdot 2H_2O$ and 1.87% $CaSO_4$; and also with a phosphate gypsum analyzing 85.64% $CaSO_4 \cdot 2H_2O$, 7.80% $CaSO_4$, and 2.20% (total) P_2O_5. The solubility in water of both gypsums is about the same, but because of its high water content the phosphate gypsum was used in air-dried condition. Additions of gypsum varied from 1% to 5% and the granulation was kept uniform for each quantity added.

The grinding tests show that phosphate gypsum retards the period of set more than ordinary gypsum and that it is also detrimental to the initial strength after 3 and 7 days. But the strengths increase quite well after 7 to 28 days. As expected, the content of gypsum amounting to 3% or more gave better results than smaller additions of gypsum; however, cements high in lime will show deficiencies in tensile strength as the quantity of gypsum added increases. With a content of 1% to 1.5% of gypsum, the cement remains rapid-setting.

So far as the tests indicate, phosphate gypsum can be used as a set retarder. A content of 0.5% to 1% P_2O_5 retards greatly the period of set of ground clinker. The weaker action of the phosphate gypsum in spite of the greater phosphoric acid content (2.20% total) is explained by the fact that only a few tenths of 1% are directly soluble in water and come into action in contrast to the case in which phosphate-bearing raw materials are used. In the case of the latter, the period of set is retarded often undesirably long, sometimes 20 hours, so that for this reason the content of phosphoric acid in raw materials should be limited as far as possible. The action of the phosphate gypsum assures the possibility of retarding the period of set either through itself or in mixture with raw gypsum rock.—*Zement* (1930) **19,** 2.

Improving Refractories for Rotary Kilns. Elber states that one of the most frequent causes of the destruction of linings of rotary kilns is the *coup de feu* or sudden increase in the heat. The sudden increase in heat may be due to the sudden diminution and retarding of the supply of raw material, the sudden diminution of the primary or secondary combustion air, or the sudden change in the quantity of coal introduced into the kiln. In order to determine the exact cause of the breaking off of the protective lining formed upon the refractory during the operation of the kiln, careful analyses were made of the following: The bauxite refractory lining of the kiln; raw cement supplied to the kiln; normal clinker produced in the kiln; ashes of the coal fired in the kiln; inner portion of crust which is in contact with the clinker; and vitrified layer constituting the weld between the crust and the refractory.

The analyses showed that the crust had a lower lime content than the normal clinker, and, correspondingly, a higher silicate, iron and aluminate content. This condition should be attributed to the influence of the ashes of the coal. The weld between the crust and the refractory represents a good combination of the clinker and the refractory substance, with a high silicate and aluminate content.

Where the protective crust which forms on the refractory lining during the operation of the kiln has become detached from the refractory, the refractory appears to be coated with a kind of glaze or enamel; this is smooth and glazed, and the weld between the refractory and the crust is very intimate. The cause which effected its breaking loose is none other than the very unequal expansion of the two elements. It appears that too little attention is paid to the factor of coefficient of expansion of the refractory brick, which is probably more important than the point of fusion or softening. The coefficient of expansion should differ little from that of the clinker or from that of the substance serving as a weld.—*Revue des Materiaux de Construction et de Travaux Publics* (1929) 241.

Developments in Cement Kilns. Naske describes rotary cement kilns in which the waste gases are utilized for firing steam boilers and for drying the crushed raw material; cellular coolers, compartment mills, feeding and control apparatus for pulverized coal; and the modern automatic shaft kiln with two blowers and divided air supply. He discusses reclaiming of waste heat from the clinker, injection of the air preheated on the chamotte lining of the kilns into the kiln as a secondary air, and suitable treatment of the raw material. The article covers the period of development which has elapsed since Naske's last report.—*Zeitschrift des Vereines Deutscher Ingenieure* 1930, **74,** 1.

Gypsum Burning. Martin describes the process and products of gypsum burning and then shows a few gypsum kettles and kilns, which he considers typical. One of these is a gypsum chamber kiln in which crushed but not reground gypsum rock is placed on the iron sheeting of trucks which are then pushed into the kiln chambers. The kiln gases do not come in contact with the gypsum, but pass around the burning chamber in the ducts. After the desired burning temperature has been reached, the kiln is left alone for a few hours so the heat can distribute uniformly. The kiln can be charged four times a week and has a coal consumption of 9 to 12.5 tons per 100 tons of burned gypsum.

The author considers the rotary gypsum kilns, as for example the Cummer, the Polysius, and the Buettner, too expensive of installation and too large in capacity for the European gypsum works, in spite of their advanced technical and economic features. Therefore, in the production of stucco gypsum, gypsum kettles are usually employed. In these kettles, placed on a brick setting, a rotary agitator or rabble moves the gypsum rock constantly while the heat is applied around the kettle. The coal consumption is about 7.5 tons per 100 tons of burned gypsum.

Estrich gypsum is burned as a rule in mixed feed shaft kilns. Normally the fuel consumption is about seven tons of pit coal per 100 tons of burned gypsum, for the Harz Estrich gypsum kiln, a typical installation. The Meier shaft kiln for providing Estrich gypsum has a rectangular cross-section, but is not of the mixed feed type, the fuel being burned in two special chambers located at opposite sides outside of the gypsum burning shaft. No ashes and slag contaminate the plaster gypsum being produced. The gypsum rock which is charged at the kiln top, is preheated by the discharging combustion gases. The burned gypsum is drawn at two discharges at the base. Observation openings are provided in the kiln to permit observance of the progress in the burn. The fuel consumption of the Meier kiln is about eight tons of pit coal per 100 tons of burned gypsum.—*Tonindustrie-Zeitung,* **52,** 63, pp. 1278-1279.

Dryer for Crushed Rock. The crushed material slides down a series of adjustable sloping floors composed of lowered plates or slots. Heated air is supplied to chambers below the floors and allowed to pass freely to the atmosphere above them. *British Patent* No. 322,274.

Effects of Particle Size of Cement on Strengths. Last year (*Zement* 1929, p. 1322 ff.) Kuehl determined in tests that the granulation of cements apparently affects the strengths of cements considerably. Graf had determined this influence earlier but in a different manner, by plotting curves of the volume-weight and the compressive strengths of cement specimens.

For mortars of greater strength, the volume weight is generally greater. This action is indicated more clearly when using

sand of mixed granulation in place of the standard sand. The tests indicate that there is justification in certain cases to make use of tests with mortars prepared in soft or liquid state and made with sands of mixed granulation, besides the present standard test for earth damp mortars which are found but seldom in concrete construction work; this approximates actual conditions.—*Zement* (1930) **19**, 3, pp. 48-49.

Dolomite Cement. Cement comprising a mixture of calcined dolomite 35 parts and magnesium chloride 12.5 parts.—*British Patent No.* 321,646.

Mannstaedt System for Producing Natural Cement. The Geseke deposit in Germany yields a natural cement which is claimed equal to artificial portland cement. The best material for natural cement should contain from 45 to 46% CaO, which corresponds to 76 to 81% $CaCO_3$; the remainder consists partly of SiO_2, some Al_2O_3 and also some MgO. The Mannstaedt system of operating a modern natural cement plant is illustrated in the article. The combustion air is supplied under pressure at the lower kiln end, where it is preheated by the burned material. Clinker is discharged continuously and automatically to the second crusher, and then stored for some time before passing to the compound mill where it is ground and some gypsum added. The cement is then stored in bulk in closed bins. The entire operation is automatic.—*Baumarkt* **27**, 20, 651-652.

Expansion of Hydraulic Binding Agents. Lafuma arrives at the following conclusions after a discussion of the theory of expansion of hydraulic binding agents: The swelling of the lime, on slaking, results in the spontaneous powdering of the slaked lime, due to the considerable increase of the absolute volume of the solid phases during the reaction; from this powdering results an enormous increase of the apparent volume. The same phenomena is produced when a solid salt reacts without previous solution with a saline solution, to give a composition of little solubility. It is easily understood that such a reaction, if it takes place in the body of a mortar, results in forces of disintegration.

Thus, from the special viewpoint of the theory of hydraulic binding agents, the chemical reactions which put solid salts into action and which give rise to the hydrated, little soluble salts, can be divided into two classes:

(1) Those reactions which occur with previous solution of the solid salts, or those which cause the set and the hardening, or which all at least are favorable to the strength of the mortar.

(2) The reactions which occur without previous solution of the solid salts, or those which cause the chemical disintegration with swelling, or expansion of the mortars, or which all at least are unfavorable to their condition.

Thus, for improving the condition of mortar, the reaction of the first class should be favored, and above all that of the second class should be suppressed.—*Revue des Mater. de Constr. et de Trav. Pub.* (1929) 243, p. 441; (1930) 224, p. 4.

Lime Burning. The pulverized material is continuously supplied to an annular kiln which has a refractory lining through which radially disposed burners extend and which surrounds an annular fuel chamber containing, e. g., coke, and surrounding in turn a central space heated by burners at the bottom; the hot gases from this space are used to generate steam which is introduced into the fuel chamber for the purpose of producing water-gas for supplying to the burners. The material is heated uniformly and, in the case of limestone, the treatment is completed in four hours.—*British Patent* No. 309,177.

Alumina and Salts of Aluminum from Bauxites or Other Aluminous Products. The powdered bauxite, freed from part of its iron (e. g., magnetically), is heated with sufficient fluorspar and sulphuric acid to dispel all the silica present as silicon fluoride, which is converted into hydrofluosilicic acid by passing it into water and the acid used for the manufacture of its metallic salts. The residual sulphates are taken up in water (the solution being easily filterable owing to the absence of colloidal silica), any iron present is oxidized (e. g., by chlorine), and the solution is treated with calcium chloride. From the mixed chloride solution, after removal of calcium sulphate, a mixture of aluminium and ferric hydroxides is precipitated by lime; the regenerated calcium chloride can be reused. The hydroxides are then suspended in dilute caustic soda, whereupon the aluminium hydroxide dissolves, the solution is filtered and into the filtrate carbon dioxide is passed to reprecipitate the aluminium hydroxide. This is filtered off and the sodium carbonate present in the filtrate is causticised for use in the first part of the process. —*British Patent No.* 306,095.

The Neuwied (Germany) Cement Plant. The present capacity of the new cement plant at Neuwied, on the Rhine, is 470,000 tons per year. Electricity for power and lighting services is purchased from a central station; it is delivered over a 100,000-v. line and transformed first to 12,500 v. and then to 3,000 v. for the large motors and 500 v. for small motors, and to 220 v. for lighting. The entire cement plant requires 9500 hp.

Limestone and clay is unloaded from Rhine boats by means of bridge cranes, equipped with buckets holding 8 tons; each material is delivered to hopper bins, and then conveyed by elevated handling track and car to the storage. From storage, raw materials are passed to triple concrete bins, one compartment each being provided for raw material, additions, and corrections, of a capacity for 1½ shifts.

There are two wet mills and two cement grinding mills, each equipped with a 850-hp. motor. They are each of 7.21 ft. dia. and 45.9 ft. length. The four slurry tanks are of 26.3 ft. inside dia. and 65 ft. 6 in. height. The three kilns are of 10.8 ft. dia. and 206.7 ft. long. The electric dust precipitating chambers back of the kilns consist of two double chambers, either one serving as a reserve. They operate with high d.c. voltage according to the Cottrell-Moeller process. Dust removal systems are located also in other parts of the cement plant.

The clinker is delivered by means of bucket elevators to six bins of 26.2 ft. dia. and 65.6 ft. height, each of 1400 tons capacity. The cement bins are of similar size. The bagging plant is located near the cement bins, while the barreling plant is located near the Rhine. Cement is shipped either by rail or boat. A complete coal handling and pulverizing plant is also provided. The bins and belt conveyor are entirely enclosed so as to avoid dust as much as possible.—*Tonindustrie-Zeitung* (1930) **54**, 6, pp. 87-91.

Cement and Phosphoric Acid from Phosphates. A suspension of finely-ground phosphate rock in water is treated with silicon tetrafluoride, whereby a mixture of silica, calcium fluoride, and calcium fluosilicate is precipitated, leaving a solution of phosphoric acid. The precipitate is collected, mixed with sand and clay, and heated to redness to regenerate silicon tetrafluoride for use again; the residual mass is suitable for the manufacture of cement.

In another patent (633,886), decomposition of the phosphate rock is effected by agitation with dilute sulphuric acid and the precipitated calcium sulphate is converted into carbonate by treatment with ammonia and carbon dioxide. The carbonate is heated with clay and sand for the production of cement.—*French Patent* Nos. 633,828 and 633,886.

Cement from Siliceous Limestones. The carbon dioxide is removed from the limestone by burning and the requisite amount of water for slaking the quicklime formed is added to the residue. The slaked lime and sand are separated by fanning, the former being used for making cement, and the sand for silicate bricks.—*French Patent No.* 630,856.

Manufacture of Silica Gel and of Calcium or Sodium Silicate. Limestone mixed with powdered coal is burned at 800-1000 deg. C. and the resulting lime is boiled with sodium carbonate to produce a solution of sodium hydroxide and a precipitate of calcium carbonate for use again. The solution is boiled with finely-divided silicious material, filtered, and treated with carbon dioxide from the lime kiln. The silica gel is removed and the filtrate boiled with more lime to regenerate sodium hydroxide. Alternatively, the sodium silicate solution may be treated with milk of lime to obtain calcium silicate or evaporated to recover waterglass.—*French Patent* No. 632,509.

Portland Cement. A charge comprising calcium carbonate, crystalline silica, e. g., sand quartzite, and metal oxides in quantity such that the product contains not more than 4% of material other than calcium silicate is calcined and the product is ground.—*German Patent* No. 457,116.

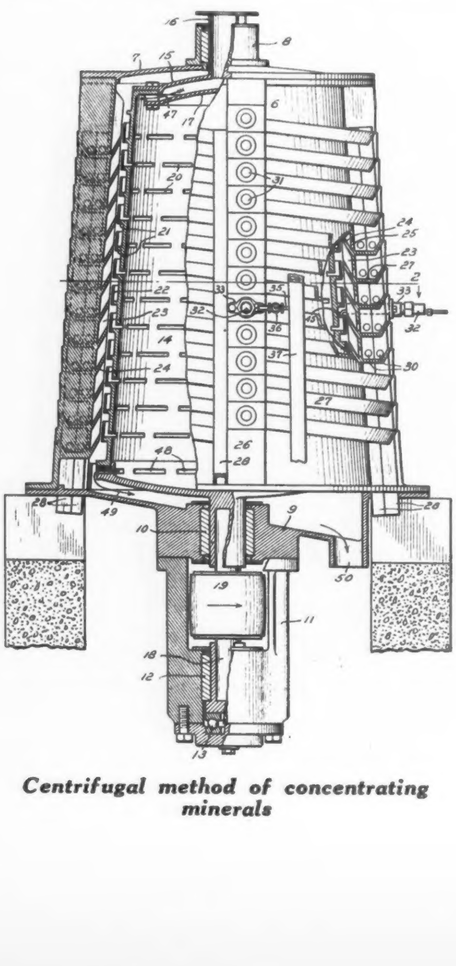
Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Fiber-Edged Wallboard. The usual type of gypsum wallboard except that there is provided a fiber edge about 1-in. in width, furnishing a suitable nailing strip for applying the board to studding. This strip serves also as a protecting edge for the gypsum body during shipping or handling of the board.—*H. C. Raynes, U. S. No.* 1,719,726.

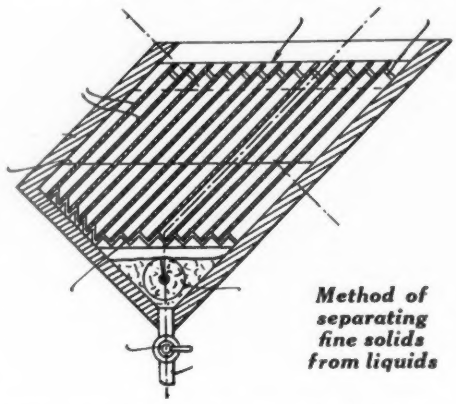
Concentration. A centrifugal method of concentration employs a hollow inverted conical bowl rotating in a similar housing. The feed is admitted through a hollow shaft and the heavier mineral particles go to the side of the bowl and work through slots to collars on the outside from which they are removed by jets. The rate of removal governs the passage of the concentrates through the slot and the kind of material secured. The tailings pass through similar slots at the bottom to a discharge chamber. *E. C. Eccleston,* June 25, 1929. No. 1,718,547.

[Interest in devices of this kind is increasing and a recent publication of the U. S. Bureau of Mines, Technical Paper No. 457, is devoted to them. In the rock products industry they might be used in cleaning fluorspar, phosphate rock and some other materials.—Editor.]



Centrifugal method of concentrating minerals

Settler. A method of separating fine solids like clay from liquids employs a tank filled with inclined baffle plates. As the plates are relatively close together the solids

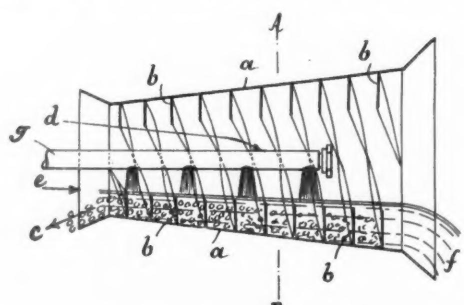


Method of separating fine solids from liquids

have only a short distance to settle before they come to rest on a baffle. Then they slide down the baffles to a space at the bottom from which they are removed by a screw in the form shown. In a modified form the settled solids are allowed to flow out through a valve.

The flow is lengthwise of the baffles and not across them as in some other forms of baffled settlers. There are cross baffles placed toward the end which prevent the current from getting down to the settled solids. This insures a quiet zone in which the solids may sink to the discharge.—*M. Sprockhoff,* U. S. No. 1,732,386.

Separator or Washer. The machine consists of a conical tube which may be rotated about its axis, with a helical web inside. A centrally disposed spray pipe furnishes water for washing. The water and light solids go out of the lower end while

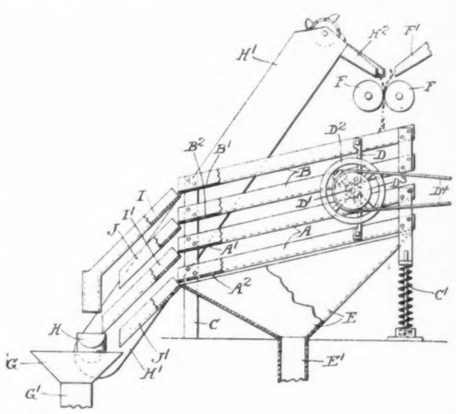


Scrubber separator for solids

the heavy solids are elevated by the action of the web to the higher end.

(This seems to be an ordinary form of scrubber already in wide use for washing gravel, phosphate rock and other mineral products. The only difference noticeable is that a continuous helical web is used instead of pieces of angle iron arranged to give the material a helical path as in the ordinary form. The effect is the same in both.)—*R. E. Trottier,* U. S. No. 1,729,913.

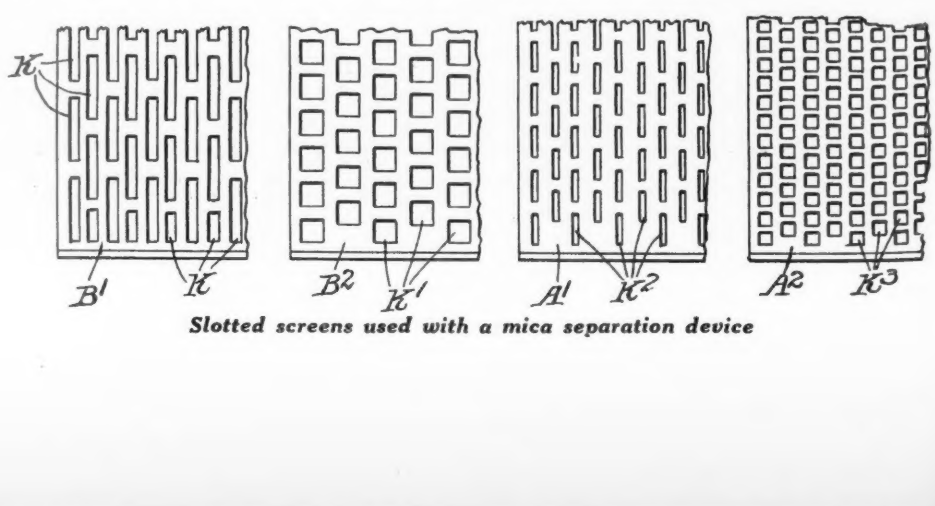
Process for Separating Mica. In a process for separating mica advantage is taken of the shape of the grains. Micaceous rock when crushed will give flat scales of mica and small rounded particles of other minerals. The feed of the mixture of this is run over a slotted screen of which the undersize is principally mica while the oversize is principally other rock. This is sent to rolls to be recrushed. A second screen



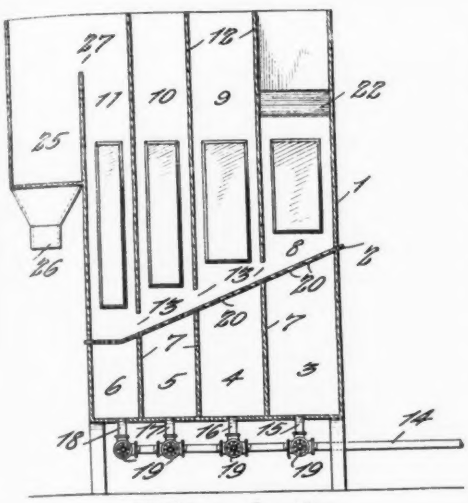
Details of a mica-separating process

has square meshes which reject the coarse mica scales and allow the remainder to pass to a third screen which has slots. With this and a fourth, square mesh, screen, the process is the same as with the first and second screen except that the particles treated are smaller.—*J. Bland,* U. S. No. 1,716,758.

Classification. A new classifier uses the method of taking off all products as overflows. It consists of a series of cells above a slanting bottom and holes in this permit the introduction of fresh (hydraulic) water. The fines are taken off at the top of the first cell and the coarser particles flow down the slanting bottom over the holes so that the rising current has a chance to sort out any grains light enough to be carried to the



Slotted screens used with a mica separation device



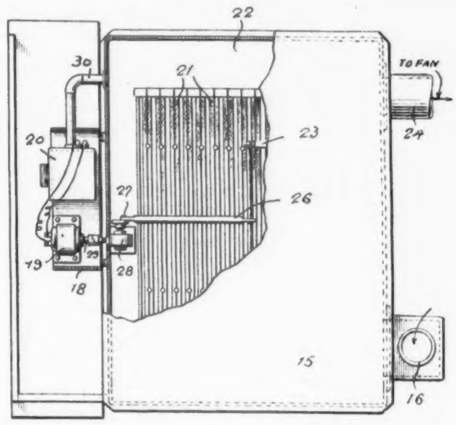
Cell-type classifier

top of the cell and out of an overflow. Each cell is made narrower than the cell before it to assist in the classification. *B. M. Bird,* U. S. No. 1,715,693.

Separating Light from Heavy Materials. The method employs an inclined shaking table made up of plates with spaces between through which currents of air rise. The mixed material flows over the table down hill and the effect of the shake and the air currents is to cause the lighter material to separate and flow above the material at a faster rate. Hence it passes over the gaps in the table while the heavier material falls through them. A solid table or pan below (which is also shaken) receives the heavy material which is carried to a discharge by the shaking motion. The lighter material flows to a separate discharge at the end.

The cut shows sectionally two shaking elements, which may be either troughs or tables, one above the other, with the feed hopper and discharges. The fan for producing the air current is shown at the end mounted on a box with dust collectors. The shaking tables are enclosed in a dust tight case. The inventor says the method has been devised for separating slate from coal but it may be used for separating any two minerals of differing specific gravity.—*H. M. Chance,* U. S. No. 1,730,189.

Automatic Dust Bag Shaker. Dust collectors of the filter type have to be cleaned by shaking the bags when the dust accumulates so that it seriously interferes with the draft of the collecting fan. Usually this is done by hand control at stated intervals. The invention describes a method of setting the shaking apparatus in motion whenever the draft of the fan shows that enough dust has accumulated. The means is a collapsible bellows on the suction of the fan, the bellows being held extended by atmospheric pressure so long as the fan is running. When the fan is stopped the bellows collapse and throw a switch that starts

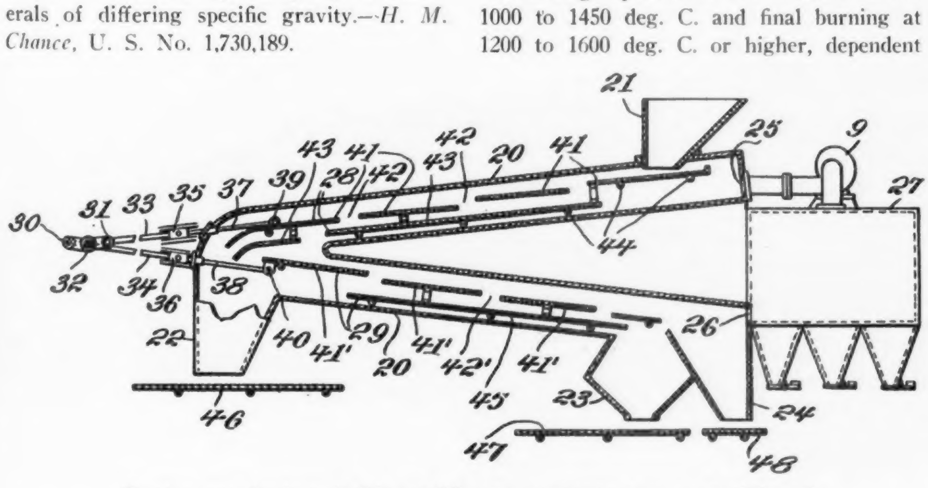


Automatic device for shaking bag filter on dust collector

the motor of the fan shaking mechanism. This runs for a predetermined time. The apparatus may be made entirely automatic by providing a pneumatic control for stopping the fan.—*C. E. Billings,* U. S. No. 1,715,273.

Two-Stage Process for Production of Cement. The method involves the production of first a sintered finely divided raw material or materials to a cellular sinter cake, which is then melted down or given the necessary high temperature, in a kiln or other apparatus, which may be stored or pulverized into a cement. The sintering is carried out in a Dwight and Lloyd sintering machine.

Sintering operations are carried on at 1000 to 1450 deg. C. and final burning at 1200 to 1600 deg. C. or higher, dependent



Device employing shaking tables to separate two materials of different specific gravity

on the raw materials. The treatment is carried on with rapidity, it is claimed, and there are no dust losses, thereby increasing the yield. Fine sinter, ¼ in. or less, may be incorporated with raw material, providing a nucleus about which the raw charge is fused. Advantages claimed for the process are: No dust losses, low fuel consumption, high speed of production, more rapid, uniform and thorough burning, minimum labor and supervision requirements.—*R. W. Hyde* (assignor to Dwight and Lloyd Metallurgical Co., New York), U. S. No. 1,746,944.

Continuous Settler. The settler shown has a long box V-shaped in the lower part. Only the section is shown here. A screw in the bottom removes the settled solids and a traveling scraper takes off scum or floating impurities from the top.

Section of a continuous settler

(The inventor says his device is adapted for thickening sewage and for use in the sugar and paper pulp industries. Similar settlers have been tried in the mineral industries and abandoned because of the wear on the screw.)—*J. Q. Horne,* U. S. No. 1,716,228.

Color Coating for Cement and Concrete Products. An artificial colored coating for concrete work or brick which can be applied while the work is still wet is claimed by the inventor. The color composition comprises a dry mixture of 12 parts of pulverized color, 6 parts of hydrated lime, 8 parts of iron filings and 96 parts of portland cement. This whole is intimately mixed and then wetted with a 50% water solution of any good cement waterproofing liquid; more of this liquid is added to yield a thin paste which can be applied to the wet or unset concrete products. After evening the face or stippling the treated product, a small amount of mica powder is dusted on the surface.—*D. C. Reed,* U. S. No. 1,735,793.

Cellular Gypsum Stucco. A composition comprising a mixture of substantially 100 parts of calcined gypsum, from 7 to 2½ parts of sodium bisulphate, from 4½ to 1 part of potassium carbonate, and less than 1 part of a mixture of blood albumin and lime.—*G. A. New (assignor to American Gypsum Co., Port Clinton, Ohio), U. S. No.* 1,745,635.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Feb. 22	Limestone Flux Week ended Mar. 1	Sand, Stone and Gravel Week ended Feb. 22	Sand, Stone and Gravel Week ended Mar. 1
Eastern	2,027	2,153	2,138	2,574
Allegheny	2,112	2,252	2,252	2,708
Pocahontas	147	186	557	588
Southern	657	638	5,890	7,013
Northwestern	490	504	888	1,068
Central Western	424	468	5,291	5,267
Southwestern	328	326	4,678	5,512
Total	6,185	6,527	21,694	24,730

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1929 AND 1930

District	Limestone Flux 1929 Period to date Mar. 2	Limestone Flux 1930 Period to date Mar. 1	Sand, Stone and Gravel 1929 Period to date Mar. 2	Sand, Stone and Gravel 1930 Period to date Mar. 1
Eastern	19,381	17,367	14,641	16,270
Allegheny	23,927	19,388	17,455	20,426
Pocahontas	1,087	1,523	2,732	4,277
Southern	3,797	4,854	56,715	50,323
Northwestern	4,737	3,992	6,568	7,374
Central Western	3,972	3,951	42,936	41,327
Southwestern	3,353	2,662	37,682	31,854
Total	60,254	53,737	178,729	171,851

COMPARATIVE TOTAL LOADINGS, 1929 AND 1930

	1929	***1930***
Limestone flux	***60,254***	***53,737***
Sand, stone, gravel	***178,729***	***171,851***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning March 22:

SOUTHERN FREIGHT ASSOCIATION DOCKET

49521. **Crushed stone,** from Mascot and Strawberry Plains, Tenn., to N. & W. Ry. stations. In lieu of lowest combination rates, it is proposed to establish rates on crushed stone, carloads (See Note 3), from the origins mentioned above, to N. & W. Ry. stations between Bristol, Tenn.-Va., and Roanoke, Va., and branches, such rates to reflect the I. C. C. Docket 17517 joint line scale, based on mileages constructed via Southern Ry. to Bristol and the N. & W. Ry. Statement of the proposed rates will be furnished upon request.

49524. **Phosphate rock,** from Mount Pleasant-Centreville district to Goodrich, Wis. Present rate, 756c per net ton. Proposed rate on phosphate rock, crude lump or crude ground, carloads, as described in and subject to minimum weight prescribed in L. & N. R. R., I. C. C. A-15803, from points of origin on the N. C. & St. L. Ry. and L. & N. R. R., as shown in Group 1 of tariff just mentioned to Goodrich, Wis., 756c per net ton, plus 540c per car. The proposed rate is made on the basis generally in effect to this point, i.e., $5.40 per car over the rates to Athen, Wis.

49532. **Sand,** from Norfolk Southern R. R. (electric division) stations to C. & O. Ry. stations in West Virginia. It is proposed to establish through rates on sand, carloads, minimum weight 100,000 lb. (when 90% of marked capacity of car is less than 100,000 lb., such 90% of marked capacity will apply as minimum), except when cars are loaded to their visible capacity the actual weight will govern, from the origins above mentioned to points on the C. & O. Ry. in West Virginia. Rates to representative destinations are as follows:

To Whitcomb, Roncoverte and Wolf Creek, W. Va., 215c; Avis and Hinton, W. Va., 225c; Brownwood, Prince, Stonewall, Lester and Woodpeck, W. Va., 235c per net ton.

The present rates were constructed on Norfolk, Va., combination, and it now develops that the rates beyond Norfolk, Va., have been canceled. The proposed rates are based on a mileage scale ranging from 70c for not exceeding 10 miles up to 125c for 110 miles, 215c for 400 miles, 265c for 600 miles and 315c per net ton for 800 miles and over 760 miles.

49555. **Sand, gravel,** etc., from Birmingham, Ala., and Group, and Calera, Ala., to Louisiana and Arkansas Railway stations. In lieu of combination rates, it is proposed to establish through rates on—Sand, gravel, stone, slag and chert, carloads, as now provided in Agent Glenn's I. C. C. A655—from Birmingham, Ala., and group points, and Calera, Ala., to L. & A. Ry. stations made on basis of the 17517 scale for actual distances, which is the same basis now in effect to competitive and cross country points on the Y. & M. V. R. R. Statement of the proposed rates will be furnished upon request.

49558. **Limestone,** from Ashford, N. C., to North Carolina destinations. It is proposed to establish reduced rate of 190c per net ton on limestone, ground or pulverized, carloads, minimum weight 30 net tons, from Ashford, N. C., to Blanche, Milton, Semora, Cunningham, Fitzgerald, Draper, Meadow Summit, Spray and Leaksville, N. C.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

49601. **Sand and gravel** from Petersburg, Va., to Boydton, Ontario, Chase City and Clarksville, Va. It is proposed to establish the following reduced rates on—Sand and gravel, carloads (See Note 3), per ton of 2000 lb., from Petersburg, Va.: To Boydton and Ontario, Va., 110c; to Chase City and Clarksville, Va., 115c, made on basis of the scale prescribed by the Interstate Commerce Commission in Docket 17517 and related cases.

49614. **Limestone and/or marble,** ground or pulverized, carloads, intraterritorially, between points in southern territory. It is proposed to cancel all existing rates on limestone and/or marble, ground or pulverized, carloads, also crushed marble, between all points in southern territory, and to establish in lieu thereof mileage scales substantially the same as prescribed by the Interstate Commerce Commission in Docket No. 19943. Copy of the proposed scale will be furnished upon request.

49633. **Phosphate rock,** from stations in the Mt. Pleasant-Centreville group to Calumet, La Salle Junction, Swedestown and Hancock, Mich. In lieu of combination rate, it is proposed to establish rate of 812c per net ton on phosphate rock, crude lump or crude ground, carloads, as described in and subject to minimum weight prescribed in L. & N. R. R., I. C. C. A15803, from stations on the N. C. & St. L Ry. and L. & N. R. R. in the Mt. Pleasant-Centreville group, to Calumet and Hancock, Mich., for account of the Mineral Range R. R. Same as rate now applicable via the Copper Range R. R. It is also proposed to establish the same rate to the intermediate stations, La Salle Junction, and Swedestown, Mich.

49649. **Crushed marble and crushed stone,** carloads, from Gantt's Quarry, Ala., Tate, Whitestone, Ga., and Knoxville, Tenn., to southwestern destinations. It is proposed to cancel the present published commodity rates on crushed marble and crushed stone, carloads, from the origins mentioned to destinations in Arkansas, Louisiana, Oklahoma and Texas, as published in Agent Johnson's I.C.C. 2007, I.C.C. 2150, I.C.C. 1982 and I.C.C. 2175, permitting lowest combination rates to apply. The present rates, to the extent published, are in excess of combination rates.

49670. **Sand, gravel, crushed stone, etc.,** from Gravel Siding and Old Ham, Miss., to points in Arkansas. It is proposed to establish rates on sand (except asbestos sand and silica sand); gravel; crushed stone (broken stone ranging in size up to 200 lb. weight); in straight or mixed carloads (See Note 3), from Gravel Siding and Old Ham, Miss., to points in Arkansas on and east of the St. L.-S. F. Ry. from the Missouri-Arkansas state line to Hoxie, Ark., thence on and east of the Missouri Pacific R. R. through Diaz, Bald Knob, North Little Rock, Little Rock, Pine Bluff, Gould and McGehee to Arkansas City, including Batesville and points on the Mo. Pac. R. R. east thereof, on basis of the joint line scale prescribed by the Interstate Commerce Commission in Docket 17000, part 11, observing as minima the joint line scale prescribed in Docket 17517, plus 6c per ton of 2000 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

19665. **Sand and gravel,** from Montgomery, Ala., to points in Louisiana. To establish rates on sand and gravel, in straight or mixed carloads (See Note 3), from Montgomery, Ala., to points in Louisiana west of the Mississippi river, on basis of 8½% of the column 100 rates, as published in S. W. L. Tariff No. 154. At present combination rates are applicable on sand and gravel, carloads, from Montgomery, Ala., to Louisiana points west of the Mississippi river. Shippers at Montgomery request a complete line of through rates and it is, therefore, proposed to establish rates based on 8½% of column 100 rates published in S. W. L. Tariff No. 154.

CENTRAL FREIGHT ASSOCIATION DOCKET

24238. To establish on **lake and beach sand,** carloads, from Muskegon, Mich., to Lapeer and Vassar, Mich., rate of $1.26 per net ton. Present rates, $1.39 per net ton.

24240. To establish on **lake or beach sand,** carloads, from Bridgman and Sawyer, Mich., to Fort Wayne, Ind., rate of $1.39 per net ton. Present rate, $1.51 per net ton.

24255. To establish on **crushed limestone,** carloads, from Detroit, Mich., to Barberton, O., rate of $1.50 per net ton. Present rate, 20½c.

24256. To establish on **crushed stone,** carloads, from Melvin and Thrifton, O., to Weston, W. Va., rate of $1.80 per net ton. Present rate, 20½c.

24262 cancels 24208. To establish on **fluxing limestone,** carloads, from Bedford, Ind., to points in Ohio, rates as shown below:

BEDFORD, IND.

	Prop.		Prop.
Mansfield	$1.76	Canton	1.96
Massillon	1.96	Youngstown	2.06

MARTINSBURG, W. Va.

	Pres. rate		Pres. rate
Massillon	$1.96	Youngstown	1.76
Canton	1.96		

FAIRPORT HARBOR, OHIO

	Class rate miles	Pres. rate		Class rate miles	Pres. rate
Mansfield	109	1.01	Canton	88	.90
Massillon	95	90	Youngstown	60	.80

Present rate, $2.39 per gross ton.

24266. To establish on **crushed stone,** carloads, actual weight will apply, from Monon, Ind., to P. M. Ry. stations in Indiana, rates as shown below. Present and proposed rates:

FROM MONON, IND.
To P. M. Ry. Stations

	Pres.	Kickapoo scale Prop.
Thomaston	90	80
Hanna	90	85
Wellsboro	90	85
LaPorte	95	90
Belfast	95	90

24283. To establish on **crushed stone and crushed stone screenings,** in bulk, in open cars, carloads, from Spencer, Ind., to Sandborn, Ind., rate of 70c per net ton. Present rate, 76c per net ton.

24284. To establish on **limestone, ground or pulverized, and limestone dust,** carloads, minimum weight 50,000 lb., from Greencastle, Ind., to destinations in the state of Illinois, rates on basis of 60% of sixth class rate. Present rates, classification basis.

24286. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grind-

ing or polishing, loam, molding or silica) **and gravel**, carloads (See Note 3), from Wolcottville, Ind., to Rivare, Ind., rate of 95c per net ton. Present rate, $1.15 per net ton.

24308. To establish rates on **crushed stone**, carloads, from Greencastle and Limedale, Ind., on C. I. & L. to stations on C. & O. Ry, carloads: C. & O. Ry., North Judson, 120c; C. & O. Ry., Peru, 135c. Present rates are on classification basis.

24316. To establish rates on **crushed stone**, carloads, from Greencastle and Limedale, Ind., on the C. I. & L. Ry. to stations on New York Central R. R. as shown below:

Road	Station	Proposed Kickapoo scale
N. Y. C.	Kendallville	145
N. Y. C.	Goshen	140
N. Y. C.	Elkhart	135
N. Y. C.	North Liberty	125
N. Y. C.	Knox	115
N. Y. C.	Schneider	120

Class rates now in effect.

TRUNK LINE ASSOCIATION DOCKET

23113. **Gravel, sand**, other than blast, core, engine, fire, glass, grinding, molding, quartz, silex or silica, carloads (See Note 2), from Machias and Springville, N. Y., to Backus, Penn., $1.05 per net ton. (Present rate, $1.15 per net ton.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

23115. **Sand and gravel**, other than blast, engine, foundry, glass, molding or silica, carloads (See Note 2), from Susquehanna, Penn., to Jefferson Jct., Brandt, Stevens Point, Starrucca and Thompson, Penn., 60c per net ton. (Present rate, 70c per net ton.) Reason—To meet motor truck competition.

23133. **Marble dust, chips and waste; marble, crushed and broken, and rubble**, carloads, minimum weight 50,000 lb., from Pleasantville, Patterson and Wingdale, N. Y., to Grassland and Llanerch, Penn., 20c per 100 lb. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

23134. **Crushed stone**, carloads (See Note 2), from Jamesville, N. Y., to Jefferson Jct., to Burnwood, Penn., inclusive, $1.25, and Herrick Center to Carbondale, Penn., inclusive, $1.65 per net ton. (Present rate, $1.95 per net ton. Reason—Proposed rates compare favorably with rates from Jamesville, N. Y., to Middletown, N. Y.

23138. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel**, carloads (See Note 2), from Georgetown, D. C., to various points in Trunk Line territory, Dalecarlia, Reservoir, Halpine, Dickerson, Weverton, Md., Harpers Ferry, Engle, Doe Gulley, Green Spring, Grace, Ridgedale, Petersburg, Millville, W. Va., Wadesville and Strasburg, Va., Cumberland, Hagerstown, Md., and various. Rates ranging from 60c to $1.50 per net ton. Reason—Proposed rates are comparable with rates from Baltimore, Md.

23144. **Crushed stone**, carloads (See Note 2), to Lewisburg, Penn., from Steelton, Penn., $1.10, and from Naginey, Penn., $1.15 per net ton. Reason—Proposed rates are fairly comparable with rates from Steelton, Penn., to Coatesville, Chatham, New Garden, Penn., etc.

23147. **Crushed stone**, carloads (See Note 2), from Steelton, Penn., to Mifflin, Penn., 90c per net ton. (Present rate, $1.15 per net ton.) Reason—Proposed rate is fairly comparable with rates to Parkesburg, Lenover and Buchanans Road, Penn.

23188. **Crushed stone**, carloads (See Note 2), from Campbell, Penn., to Gap, Penn., 80c per net ton (Present rate 85c per net ton). Reason—Proposed rate compares favorably with rate from Bainbridge, Union Stone Co., Penn., to Gap, Penn., and from Campbell, Penn., to Blue Mont, Galt and Taneytown, Md.

23199. The C. R. R. of N. J. Tariff I. C. C. G2742 carries rates on **sands** from stations in South Jersey to destinations located on the New York Central R. R. and West Shore R. R. These rates vary according to sort of sand shipped, viz.:

Sand, other than blast, engine, filter, glass, silica, silex, quartz, molding or foundry, being subject to the lower scale of rates; sand, blast, engine, filter, glass, silica, silex, quartz, molding or foundry, carrying the higher scale.

It is proposed to maintain the present rates, but amend the description to read as follows:

Rates on low grade sand to apply only on sand (or gravel) loaded in open-top equipment. Rates on high grade sand to apply only on shipments loaded in box cars or other closed equipment.

Reason—Proposed basis is comparable with that from Reading Co. and P. R. R. South Jersey shipping points.

23209. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, **and/or gravel**, carloads (See Note 2), from North East, Md., to Wye Mills, Bloomingdale and Queenstown, Md., $1 per net ton. Rate to expire September 30, 1930. Present rate, $1.25 per net ton. Reason—To meet barge and motor truck competition.

23213. **Stone, natural, crushed**, carloads (See Note 2), from Mill Hall, Penn., to Wallaceton and Bigler, Penn., $1 per net ton. Present rate, $1.10 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

23215. **Ganister stone**, carloads (See Note 2), from Cumberland, Md., to Baltimore, Md., $2.50 per net ton. Present rate, 24½c per 100 lb., sixth class. Reason—Proposed rate is comparable with rates to Steelton, Penn., and Buffalo, N. Y.

23216. **Crushed stone**, carloads (See Note 2), from Cumberland, Md., to Baltimore, Md., $1.60 per net ton. Present rate, 24½c per 100 lb., sixth class. Reason—Proposed rate is comparable with rate from Ackerman, W. Va., to Baltimore, Md.

23218. **Sand** (other than blast, engine, foundry, glass, molding or loam) **and gravel**, carloads (See Note 2), to Bergoo, W. Va., from Wheeling, W. Va., $2; New Martinsville, W. Va., $1.90, and Parkersburg, W. Va., $2 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

19191. **Beach or shore stone** (See Note 3), from Essex and Gloucester, Mass., to Lynn, Mass. Present rates, 10½c and 9c, respectively; proposed, 70c per net ton. Reason—To meet motor truck competition.

19257. **Stone, broken or crushed, in bulk**, in gondola or other open cars (See Note 3), from various N. Y. N. H. & H. R. R. stations to various N. Y. N. H. & H. R. R. stations. (Exhibit showing proposed and present rates will be furnished upon request.) Reason: To cancel specific commodity rates and restore mileage basis.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3950. **Silica sand**, carloads, from Ottawa, Ill. Rates per net ton:

To	Pres.	Prop.
Nashville, Tenn.	*	$3.70
Atlanta, Ga.	*	4.50
Elberton, Ga.	*	4.65
Macon, Ga.	*	4.65

*Combination.

WESTERN TRUNK LINE DOCKET

1376-H-H. **Sand, silica**, carloads (See Note 1), but not less than 60,000 lb., except where car of less than 60,000 lb. capacity is furnished at carrier's convenience marked capacity of car will govern, from Oak Hill, Kan., to Fredonia and Mildred, Kan. Rates: Present—17½c; Mildred, 21½c. Proposed—Fredonia, 12c; Mildred, 15c.

Stone Company Officials Appear Before I. C. C.

REPRESENTING the Memphis Stone and Gravel Co., W. E. Gamewell and W. H. McDonald appeared before the interstate commerce commission at Washington March 5 in the controversy involving freight rates on sand and gravel in the Mississippi valley. The controversy is between the state government and the railroads.

Judge William Bagry, Nashville, represented the state; J. S. Burchmore, Chicago, represented Tennessee and Mississippi litigants; J. O. Hendley, Nashville, represented the Tennessee Railroad Commission, and A. B. Tanner, Chicago, represented the Allen Gravel Co., Memphis and Gravel Siding, Miss.—*Memphis* (Tenn.) *Commercial-Appeal.*

I. C. C. Reports

Sand and gravel. Examiner Michael T. Corcoran in No. 22420, Missouri Gravel Co. vs. C. B. & Q. et al., found rates on sand and gravel from LaGrange, Mo., to Industry and Littleton, Ill., unreasonable. Reparation recommended.

Propose to Equalize Sand and Gravel Rates in Mississippi Valley

BELIEF that the interstate commerce commission is favorably inclined toward a proposal of the Alabama public service commission for equalization of sand and gravel rates in the Mississippi valley, Alabama and Georgia, was expressed recently by Hugh White, president of the Alabama commission. He had just returned from Washington, where he participated in oral argument before the federal commission.

The Alabama commission has proposed that the rates into the Mississippi valley territory, which includes Mississippi, west Tennessee, western Kentucky and a part of Louisiana be made on the same basis that now applies interstate in Georgia and Alabama and intrastate in Alabama, to enable Alabama producers of sand and gravel, crushed stone and slag to ship into the Mississippi valley territory.

"At present rates between points in the Mississippi valley territory are lower than our rates, and prevent producers in Alabama and Georgia from competing with producers in that territory on an equal level," the commission president said. "I was impressed by the turn the arguments took and believe the interstate commerce commission is favorably inclined to our view, inasmuch as it is in line with its policy of making rates uniform in southern territory."—*Montgomery* (Ala.) *Journal-Times.*

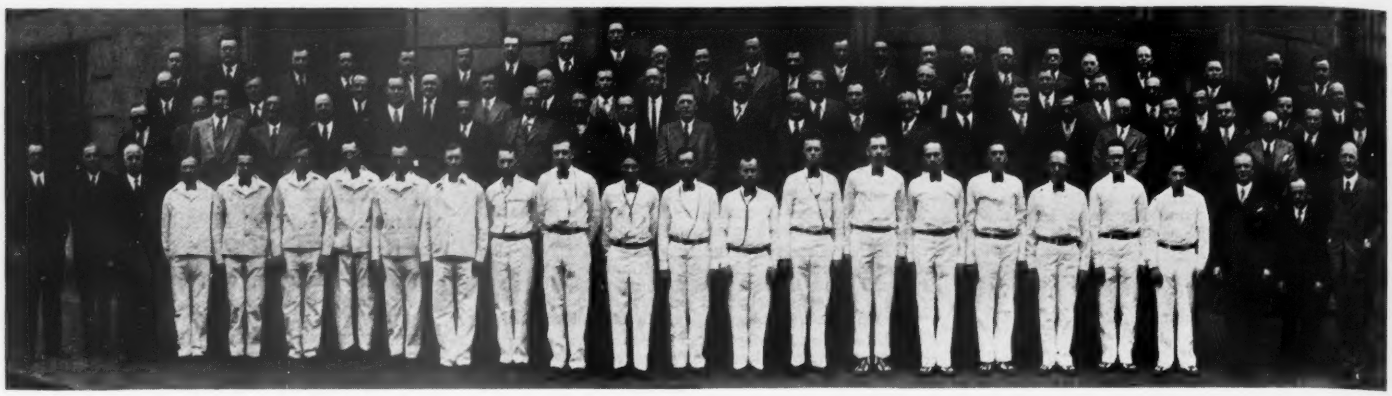
Rates on Ground Mica

BY an order entered recently in Investigation and Suspension Docket No. 3430, the Interstate Commerce Commission suspended from March 4, 1930 until October 4, 1930, the operation of certain schedules as published in Supplements Nos. 16 and 18 to Agent F. L. Speiden's tariff, I. C. C. No. 1283.

The suspended schedules propose to change the commodity description of ground mica, carloads, from Spruce Pine and other North Carolina points on the Clinchfield railroad to South Atlantic and Virginia ports, on traffic for export and for transhipment to the Pacific coast via the Panama Canal, so as to apply only on dry ground mica, which results in the application of higher rates on shipments of wet ground mica.

Grand Rapids Gravel Rates

GRAVEL shipping rates between Grand Rapids and Big Rapids, Mich., were fixed at 45 cents a ton, and between Grand Rapids and Stanwood, Mich., at 50 cents a ton by Judge Leland W. Carr of Ingham circuit court at Lansing, Mich., in a decision on the litigation between the Pennsylvania railroad and the state utilities commission.



Regional safety meeting, Portland Cement Association, Des Moines, Iowa

Iowa and Minnesota Cement Mills Hold Safety Meeting

THE ANNUAL safety meeting of the cement mills of Iowa and Minnesota, held under the auspices of the Portland Cement Association and the National Safety Council, took place at Hotel Fort Des Moines in Des Moines on March 18. Participating in the meeting were the operating departments of the Dewey Portland Cement Co., Davenport; Hawkeye Portland Cement Co., Des Moines; Lehigh Portland Cement Co., Mason City; Northwestern States Portland Cement Co., Mason City and Gilmore City; Pennsylvania-Dixie Cement Corp., Des Moines, and Universal Atlas Cement Co., Duluth, Minn. One hundred men were present.

The program for the meeting was as follows:

MORNING SESSION

(W. H. Klein, general manager, Pennsylvania-Dixie Cement Corp., presiding.)

Report of Accident Prevention in Cement Industry for 1929, by A. J. R. Curtis.

"Electrical Hazards in Industry," by R. H. Miller, manager, General Electric Co., Des Moines.

"Results Obtained from Physical Examinations at Duluth Plant," by A. S. Hetherington, Universal Atlas Cement Co., Duluth, Minn.

"The Present Status of Industrial Medicine," by Dr. H. E. Ransom, Des Moines.

LUNCHEON

(Chairman, H. F. Tyler, first vice-president, Dewey Portland Cement Co., Davenport, Iowa.)

Address—Hon. Henry Hoyer, commissioner of labor, state of Iowa.

AFTERNOON SESSION

(R. H. Bechtold, superintendent, Pennsylvania-Dixie Cement Corp., presiding.)

"Quarry and Crushing Department," G. S. Parker, superintendent, Dewey company.

"Raw, Burning and Finish Department," Stanley Griffith, master mechanic, Pennsylvania-Dixie Cement Corp.

"Power, Shops and Repair Department," Robert Patterson, Lehigh.

"Packing, Shipping and Storage Department," S. A. Bemis, packing house foreman, Northwestern States.

"Railroad and Yards Department," H. M. Hanson, assistant superintendent, Northwestern States.

"Coal Grinding and Handling Department," George W. Cross, foreman, Dewey.

"Construction Department," Carroll Bennett, assistant superintendent, Hawkeye.

"Practical Value of First Aid Training," W. D. Ryan, safety commissioner, U. S. Bureau of Mines.

First aid contest in charge of Mr. Ryan.

W. H. Klein

The contest was between teams of the Dewey, Hawkeye and Pennsylvania-Dixie plants.

DINNER

Toastmaster, Edward O'Dea, Des Moines.
Address—Arthur H. Brayton, editor, *Merchants Trade Journal.*

Electrical Hazards in Industry

Mr. Miller's paper on "Electrical Hazards in Industry" was in part as follows:

The object of this paper is to point out some of the electrical hazards in the cement industry. The modern cement mill, almost 100% electrified, makes up a system larger than the average city of 5000 population. Whether the mill operates on its own generating plant with or without waste heat boilers, or purchases and transforms its own power, electric transmission lines making up the distribution system around the plant are so prevalent that every safe worker must possess a wholesome respect for the dangerous current with which he might come in contact.

Many cases of open exposed wiring are particularly found in the older plants. This wiring was installed at a time when it represented the best practice. Enclosing the conductor in an iron pipe, or conduit, was used to very limited extent in the earliest distributing systems, but the cost was great as compared with open wiring, and the hazard at that time was not fully recognized. This situation is being rapidly changed. The older plants are using conduit and enclosed switches for practically all new circuits, and many of the original circuits have been reconstructed in this manner.

There are instances where conduit wiring may prove a hazard. Fires have originated and men have been electrocuted where the conduit was not properly grounded. For instance, in wooden structures and places where an effective low

H. F. Tyler

resistance ground is practically impossible, open wiring of an approved construction may actually be safer than conduit. One of the greatest hazards is that of ungrounded or poorly grounded conduit and control equipment. All conduit, lead sheath on cables if used, switch cases, compensators, controllers, and in general all equipment with which anyone is liable to come in contact, should be effectively grounded. There is considerable to be said in connection with grounding, method of testing grounds, etc. In reading over all of the matter that I could get hold of in view of preparing this paper I was surprised not to find a single reference to method of testing grounds, though it is most important that tests of grounding, particularly in the quarry, should be made at regular intervals.

Analyses of Some Typical Accidents

There were 33 fatal accidents during the year 1928, and four of these were chargeable to electrical causes. I have read the report of each of these, trying to learn, if possible, how easily they might have been avoided. A brief review will best indicate to you what the hazards were in these cases.

1. American, age 21; length of service, 2 weeks; occupied as a construction laborer; took hold of wire which was in contact with a live circuit, the accident happening under one of the kilns. It would appear that the cause of the accident was either carelessness or improper supervision.

2. American, age 26; service, 11 years; occupied as a switchboard operator. Accident occurred back of power house switchboard while this man was attempting to insulate an exposed nut on a pothead; he accidentally came in contact with the pothead terminal. This was a new pothead back of the switchboard, and the switchboard operator, observing that the electrician was in danger of coming in contact with the high voltage circuit, went back of the board to insulate the exposed point of danger. You cannot judge the man incompetent, hardly careless, but rather misdirected judgment on the part of an experienced employe.

3. Man employed as an erector, assisting to place a wooden block on a cable that had been swung and moved in a position too close to a high tension line of the dust collector system. He received probably a light shock, but sufficient to cause him to lose his balance and fall.

4. Compensator on hammer mill elevator.

The accidents described clearly indicate how they can and have happened.

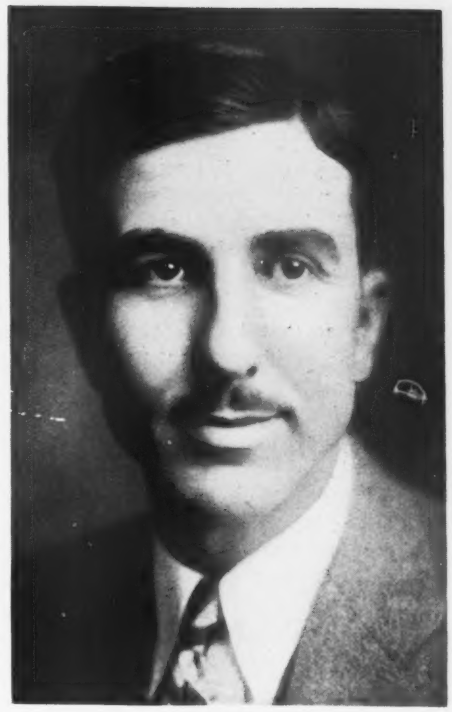
Low-Voltage Hazards

In the past few years low voltage accidents have been increasing in number. There seems to be a general feeling that 220 and 110 volts is practically harmless. Such an understanding is not at all the case. Lamp cords carrying 110 volts have furnished the necessary power to cause instant death on a number of occasions. The question is sometimes asked, what voltage is absolutely necessary to cause death or perhaps a serious burn? As a matter of fact, voltage is only one of the three factors that have to do with the results. Tests have shown that ¼ ampere flowing through the body is sure to be fatal, as the body tissues are burned and muscles paralyzed. Less than 60 volts have been known to produce this amount of current.

Places with wet floors, such as the basement, turbine room, compressor pit, or in the vicinity of raw material blending tanks are dangerous if extension lamps are carelessly thrown around, as fatal results are sure to follow. An extension light should never be taken inside of boiler by workmen for use in inspection work, unless the electrician, thoroughly familiar with the danger, has personally inspected the extension cord and has approved it for the particular job. A pocket flashlight is safe for this kind of work and is recommended.

Use Safe Switches

Starting switches and control apparatus for electric motors in particular should be of the enclosed type. Wherever electric energy is interrupted, as is the case with control switches, oil circuit breakers, air circuit breakers, etc., caution must be exercised both on the part of the operator in carrying out the instructions given him



A. S. Hetherington

by the electrical superintendent and the electric department in proper maintenance work. The oil circuit breaker, if properly designed and maintained, will interrupt the circuit line and no harm is done, but the momentary energy dissipated will be in the neighborhood of ten times the normal capacity of the transformer bank or turbine unit, as the case may be. If the power supply is a 5000-hp. turbine unit, the momentary energy to be interrupted by the circuit breaker would be about 50,000 hp.

All Accidents Should Be Investigated

It is, therefore, no wonder we sometimes have electrical explosions resulting in considerable damage. Inspection should immediately follow an accident which has forced a breaker to open under short-circuited conditions, for the contact points may be pitted in such a way that they cannot make proper contact, or something else essential to correct operation may need attention. Of course, inspection can not be made on every occasion, but the switch should be observed for a high temperature as will result from inadequate contact and, if found to exist, repairs made before it is too late. All circuit breakers should in general be thoroughly inspected at least once a year and such parts as damaged, including the oil, properly serviced.

The replacement of blown fuses without proper tools or precautions is the cause of frequent accidents. Most motor installations are now protected with proper overload relays and fusing ahead of the starting switch is unnecessary. These fuses have been replaced with copper strips, which may be used as a means for

disconnecting the switch from the power circuit. While this arrangement is superior to the old fusing method, the safest way to complete the installation is with the use of an approved type of disconnect switch. It is particularly encouraging to note that the use of disconnect switches is increasing, which enables the maintenance crew to kill the circuit ahead of the startting switch and repairs to the switch or motor carried on without any fear of electric shock.

Remember that hurry reduces caution and invites accidents. Take time to be careful. Accidents resulting from carelessness are inexcusable. In other words, stop—look—think! It is impossible to make a set of rules that would apply to all lines of industry, but it is possible to create the tendency to always think and act in terms of safety, which is more valuable than a specific set of rules. Certain basic rules, however, must be laid down and understood, and violation of such rules should render a man liable for discharge.

Basic Rules for Safety

1. No workman other than one of the electrical department should approach a live circuit, 2300 v. and below, closer than 1 ft., and in case of high voltage service found in plants purchasing their power, which in this state, I believe, is less than 50,000 v., 3 ft. should be the closest distance of approach.

2. Employes whose duties do not require them to approach or handle electric equipment or lines should keep away from such equipment or lines. They should cultivate the habit of being cautious and to heed warning signs and, further, to warn others whom they may see in danger.

3. No wiring or connections should be attempted while voltage is on.

4. Be sure the apparatus on which you are about to work is dead.

5. Bad splices are a hazard and those who are responsible for making them should learn to do this job well and consider it an art.

6. No employe should do work for which he is not properly qualified on or about live equipment or lines, except under the supervision of an experienced, properly qualified person.

7. If an employe is in doubt as to the proper performance of any work assigned, he should request further instructions of the responsible person.

8. Workmen whose employ takes them in the neighborhood of electric supply equipment or lines the danger of which they are not entirely familiar, should not proceed until authorized and should then be accompanied by a properly qualified person.

These are some of the basic rules, and I understand all of the cement plants have made a set of rules particularly applicable to their safety requirements. While every employe is supposed to be familiar with these rules, I feel the action taken by some of the electrical manufacturers in requiring each employe to sign a pledge that he has not only read but understands these basic rules, is most impressive and well worth while.

Results from Physical Examinations at Duluth Plant, Universal Company

Mr. Hetherington's paper on the subject of physical examination follows in part:

There is one consideration that is coming to the front in this age of speed, namely, the health and physical condition of the employes. It has attracted the attention of the heads of many industries during recent years and considerable progress has been made, but from all present indications I believe we can expect far greater progress during the next few years.

The required physical examination for prospective workmen was inaugurated at the Duluth plant a few years ago. Prior to this time men were chosen at random for the various kinds of work to be done in the plant, irrespective of their physical condition. Good judgment, powers of observation, and the man's word were the only means used in selecting the men, and these means failed at times.

True Physical Condition Must Be Known

When applying for work a man may be questioned about his physical condition, whether he has a hernia; the condition of his eyes, whether he wears glasses when doing certain kinds of work; how his hearing is, and many other questions that may come to one's mind. Almost invariably a favorable answer will be given. A man will sometimes misrepresent some condition in order to get a job, thinking he would be turned down if the facts were made known to the prospective employer. If the man succeeds in getting a job he may continue to work for some time, when he may be the cause of an accident resulting in an injury to himself or some other man, due to his defective physical condition. Had the employe's true physical condition been known he might have been given different work or advised to see his physician and return after his condition had been corrected.

We have required physical examinations for several years and are firmly convinced that they are a good thing. When physical examinations were started at the Duluth plant every employe was asked to report at the dispensary for examination. It was made perfectly clear to them that their records and all other information relative to the examination was absolutely confidential, being available only to the doctor, the superintendent and the man in charge of labor. It is true that at first there was some little opposition, but they now appreciate the benefits to be derived and welcome the examination rather than object to it. It has uncovered many defects in the men who were given employment before examinations were started. One feature brought out was the great number of employes who had badly decayed teeth. Each one was advised to see a dentist and have his teeth repaired.

Beware of Invisible Body Defects

We may have defects of the body which we know nothing about and are commonly unaware of. One of these in particular is high blood pressure. Many cases of high blood pressure were found in one

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Hawkeye Portland Cement Company

SAFETY RULES TO BE FOLLOWED BY EMPLOYES OF ELECTRIC SHOP

Always remember you are expected home the way you leave for work.

Always keep the floor clean from pipe, boards with nails in, and any material that is likely to cause injury to anyone.

NEVER take a chance. If you are not SURE, ask someone that knows.

NEVER work on any motor or machinery while it is running, or an any electric circuit until the circuit is made dead.

AT ALL TIMES be sure and flag switches that are pulled when you are working on motor or circuit. (Flag marked MAN WORKING ON MOTOR.) Lock all switches when possible.

Motor tenders are to use goggles when blowing motors.

NEVER change a light above 50 watts without first killing said circuit.

When any man in this department sees any man outside of this department fooling with extensions, lamps or any electric device, he is to report same to chief electrician or his foreman.

BE SURE and keep all dirt, magazines, paper or rubbish out of and off the top of all switch boxes.

When using rope or chain falls, always inspect thoroughly before putting any weight on them.

NEVER turn an air hose on another man unless he knows you are going to do it, and then be sure the pressure is cut down low enough not to cause injury to him.

EVERY man in the electric department is to make himself thoroughly acquainted with the rules of artificial respiration in case a fellow worker does get tied up with an electric circuit.

BE SURE to have all clothing without torn places. This applies mostly to motor tenders with ragged sleeves or worn-out gloves.

REMEMBER to do your playing at home, as playing on the job is DANGEROUS.

R. A. RISH,
Chief Electrician.

mılf, and all of these men were advised to see their physicians and instructed to return to the dispensary for a recheck after their condition had improved. It is as impossible to detect high blood pressure by looking at a person as it is to try to look through a stone wall in order to see what is on the other side. Neither can one detect poor eyesight just from observation. It is startling and amazing, to say the least, when you consider the number of people who are unaware of the condition of their eyes.

The same thing applies to hearing, heart trouble, and many other ailments. There were several men who were continually complaining about having some kind of ailment. Examinations disclosed the fact that diseased tonsils were the causes of considerable trouble, especially in the case of one of the men who had been complaining about his back. He had his tonsils removed and the ailment disappeared.

Examination Facilities

Our facilities for conducting examinations consist of a dressing room of three booths, one for the man being examined, one for the man to be examined, and one for the man who has been examined, and examining room and a laboratory. The examining room should be large enough to permit the examination of the eyes and should include a scale, blood pressure apparatus, and an eye chart. The laboratory should be equipped to make urine analysis.

A man presenting himself at the dispensary for examination is given a robe, shown into a booth, and told to remove all his clothing. He is then given a private physical examination which includes eye test, temperature, pulse, blood pressure, chest, heart, lungs, urine analysis, etc. The doctor should treat this man as if he were a patient who had come to his office for an examination. He should explain the reason for it and enlighten the man as to any defects he finds. In case a defect is found which would seriously impair or endanger the employe in his present occupation, he should be transferred to some other occupation.

There is a nurse in charge of the dispensary from 8 a.m. to 5 p.m. to give first aid for all injuries. She also does social service work such as calling at the homes of employes and offering all possible assistance in cases of sickness or disability.

Indirectly physical examinations have proved beneficial in more ways than one. It not only uncovers the defects at that particular time, but the man realizes the benefits to be obtained from such an examination and will be examined periodically on his own initiative. It also gives the employe a more satisfied feeling that he is not working beside a man who might have some communicable disease.

Minor Accidents Often Become Major Injuries

It has always been a difficult proposition to have the men report all minor injuries such as cuts and scratches. The majority of them appeared to think they would be considered doing the baby act, as they called it, to go to the dispensary with a small cut or scratch. A wad of tobacco was sufficient, as far as they were concerned, for a dressing. Pressure was brought to bear on the situation after a few cases of infections were reported due to neglected cuts or scratches. Results came very slowly at first, but after two or three cases of infections due to neglect were disciplined to the extent of three days off, the men began to realize that they should report all their injuries. So, during the last few years, infections have become less and less, until at the present time they are almost unknown.

What the ultimate outcome of all this will be remains to be seen. It is true there will be men physically unfit, who on account of their unfitness will be unable to obtain work. I believe physical examinations have had a great deal to do towards helping the men to care for their health. I also believe that examinations should be made periodically. Just because a man is all right this year does not necessarily mean he will be all right next year. And lastly, through the requirement of an examination before employment, there is little doubt about the physical fitness of the applicant.

Commissioner Hoyer on General Safety

At the luncheon, Iowa State Commissioner of Labor Henry Hoyer spoke as follows on the general subject of safety. He said in part:

"It is about 20 years ago that safety as we now know it was put forth in an organized form. Railroads, public utilities and all large industrials, formed safety organizations, adopted rules to protect their employes, and organized first aid teams to take care of injured persons until a surgeon could be called and take charge of the case. Municipalities have also taken up the great work and now occupations that were formerly classed as hazardous are now comparatively safe and workers and employers are being educated in this great humanitarian move until it is considered one of the great responsibilities in the operation of their properties.

"There is the National Safety Council, the Safety Section of the American Railway Association, and all branches of industries have their safety councils, as well as all large municipalities. All traffic rules enforced by our cities and towns are merely safety laws or rules—all rules for the operation of a railroad or a great industry are simply safety rules.

"This being the truth boiled down, then safety is, in the last analysis, doing one's work in an efficient, orderly manner, or directing work in an efficient, orderly manner. The great factor in safety is to think on terms of safety to one's self and to one's fellow man.

"The safety campaigns carried on by the Chicago Great Western Railroad Co. shop foremen and employes located in my own home town, Oelwein, has reduced its accidents so that during the month of December they did not have an accident. Many other large companies have reduced accidents 75% and 80% by education and safety campaigns. Every citizen is affected by coal mine accidents, according to statistics issued by the United States Bureau of Mines. The annual financial loss is estimated at $188,000,000, which amounts to an additional cost of 14 cents for each ton of coal mined. This is exclusive of lost wages, which total in a typical year $106,000,000. A coal mining company in Illinois has for 10 years experienced an average of six fatal accidents per year. They were able to induce nearly 100% of their employes to take the first aid training and for 13 months thereafter did not have a fatal accident.

"The past year has been outstanding in the great increase in the number of employers who have made an intensive effort in providing safe working conditions for their employes and in training their men in safe working methods."

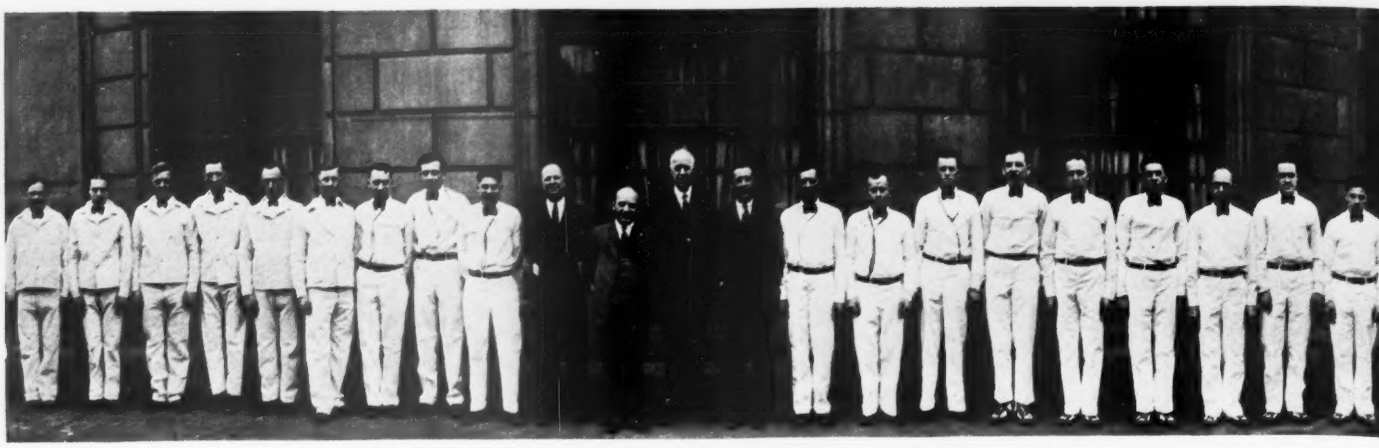
Mr. Hoyer then gave an account of how the factory inspectors had been instrumental in reducing the hazards and consequently the number of preventable accidents in Iowa.

Unemployment Situation Serious

In discussing unemployment, Mr. Hoyer said:

"The greatest problem that confronts the American people today is that of unemployment. It is estimated that over 3,000,000 are now out of employment—men who are able to work and who want work. Improved machinery, merging of plants resulting in mass production and greater efficiency in management of the industry of manufacture is the cause of making inroads in this country upon the wage earners, and production has increased on a large scale. A speaker at a meeting I attended in New Orleans the latter part of December asserted: 'As things are now, men are finding it harder and harder to find work as they grow old. It is difficult now for a man to get employment in a mechanical plant if he is over 35 years old. Older men are being turned out as fast as possible.' The speaker stressed the need of greater social action on the part of the community, declaring that only the communities—the masses—have the power to prevent the disasters which he outlined.

"The only means to keep labor em-



First aid teams and judges at the Des Moines, Iowa, regional safety meeting

ployed is to find new avenues of employment through new industries or the enlargement of those we now have. The recommendation made by Governor Hammill and carried out by the highway commission, to pave 1000 miles instead of 750 miles during 1930, is going to guarantee a lot of work this spring and summer and will reduce the unemployment in the state of Iowa. The way to improve our conditions is to furnish employment, not to talk unemployment.

"John B. Andrews of New York City, secretary of the American Association for Labor Legislation, stated at New Orleans that he was opposed to the so-called employment bureaus and stressed that public bureaus carried on by governmental aid and charging no fees will be the final solution of the evil.

Surplus of Employes

"The State Federal Employment Service, through the Bureau of Labor Office, is maintaining two employment offices, one in Des Moines and one in Sioux City. The offices are under the supervision of the commissioner of labor, who is also, so far as the federal service is concerned, designated as federal director of the U. S. Employment Service of Iowa. The bieninum report issued by the Bureau of Labor, ending June 30, 1928, says that 60,609 jobs were filled through this service. Of these, 40,918 were by men and 19,691 by women; 23.4% of jobs filled by men and 82.1% of jobs filled by women were casual or short term jobs. Of farm jobs, 12,012 were filled by men and 483 by women.

"There were a total of 164,029 registrations for jobs. This does not indicate that many separate persons, as in some cases the same person registered a number of times. This latter was especially true in all casual employments. The figures therefore cannot be used to indicate unemployment except that taken in connection with the 56,325 jobs offered during the period, and comparing week by week, or month by month, the evidence is complete of a surplus of employes at all periods.

First Aid Contest Interesting

The first aid contest under the direction of W. D. Ryan, safety commissioner of the U. S. Bureau of Mines, proved extremely interesting. The occasion was the first on which teams of the Iowa mills had ever competed with others outside their own plants. The judges were Dr. John M. Griffith, a prominent industrial physician of Des Moines; E. R. Maize, junior engineer, U. S. Bureau of Mines, and Claude P. Dempsey, foreman miner, U. S. Bureau of Mines.

The results of the contest, as announced at the dinner, were as follows:

Hawkeye Portland Cement Co. team, score 99.

Pennsylvania-Dixie Cement Corp., Des Moines team, score, 98½.

Dewey Portland Cement Co., Davenport team, score 98⅓.

Markings received by all three teams commend them for general excellence, the lowest score being higher than the highest recorded in many similar contests. As a result of its high score the Hawkeye team was awarded the Iowa cup.

At the dinner, held in the ballroom of the Fort Des Moines in the evening, Edward O'Dea of Des Moines acted as toastmaster and Arthur H. Brayton, editor of the *Merchants Trade Journal* as principal speaker.

Registration, Regional Safety Meeting, Des Moines, Iowa

Dewey Portland Cement Co., Davenport, Iowa
George R. Cross, mill foreman.
C. L. Hoots, carpenter.
Scott Hunter, laboratory.
Charles W. Moore, hoist operator.
S. K. Mosier, electrician.
Walter Pagel, repair department.
G. S. Parker, superintendent.
Howard Portenbach, craneman.
Lewis R. Sims, safety director.
H. F. Tyler, first vice-president.

Hawkeye Portland Cement Co., Des Moines, Iowa
J. C. Bennett, assistant superintendent.
Earl M. Donahue, chief clerk.
D. L. Gilbert, assistant chemist.
A. H. Gilbert, repair foreman.
Lee Harris, laboratory assistant.
E. A. Hawley, chief engineer.
C. A. Kasdorf.
Helmuth Krarup, superintendent.
W. B. Levack, foreman.
Ward E. Lewis, packhouse foreman.
A. F. Mandia, chemist.
James V. Mandia, chief chemist.
B. E. Manley, purchasing agent.
W. V. Morris, boiler operator.
Everett Powers, salesman.
H. Y. Readinger, assistant treasurer.
R. A. Rish, chief electrician.
Harry Rudasill, machine foreman.
Albert Silio, assistant physical tester.
M. T. Steiner, sales department.
John S. Tubbs, engineer.
William Van Sant, laboratory assistant.
J. O. Welborn, engineer.
W. B. Williams, machinist.

Lehigh Portland Cement Co., Mason City, Iowa
W. H. Patterson, plant engineer.
Sidney V. Scott, timekeeper.

Northwestern States Portland Cement Co., Mason City, Iowa
L. S. Atkinson, foreman.
S. A. Bemis, foreman.
Leo Benoit.
G. C. Blackmore, chief chemist.
Richard Burgroff, night superintendent.
Gilbert Greguson.
Joe Hall, foreman.
H. M. Hansen, assistant superintendent.
A. M. Idenberry, master mechanic.
Raymond H. Meyer, engineer.
George Sharp, foreman.
George A. Smith, general mill foreman.
J. J. Straw, chief electrician.

Pennsylvania-Dixie Cement Corp., Des Moines
R. A. Bechtold, superintendent.
Charles E. Bishop, carpenter.
John B. Buell, repairman.
E. N. Dodd, safety engineer.
Leonard Downey, crane operator.
C. W. Ellis, purchasing agent.
George Erlinger, quarry foreman.
Wyatt Farris, operator, coal mine.
Ralph Goodrich, coal grinder.
Louis T. Gray, burner.
S. H. Griffith, master mechanic.
Louis A. Gruber, welder.
J. H. Henderson, mill foreman.
A. Herman, repairman.
R. J. Hild, sales manager.
K. C. Kastberg, engineer.
W. H. Klein, general manager.
Henry Kline, crusher foreman.
Harley Matherly, raw grinding.
Thomas F. Miller, yard foreman.
A. W. McCullough, raw grinder.
J. O. Moore, bookkeeper.
E. P. Newhard, chief chemist.
Guy D. Pitts, assistant treasurer.
O. W. Parker, repairman.
O. E. Roe.
A. E. Sherwood, packhouse.
M. L. Silcox, chemist.
C. Stotts, mill foreman.
Ralph Stotts, chemist.
H. E. Thompson, machine shop foreman.
Cloid Thornsderry, chief electrician.
Peter Truscam, physical tester.
J. S. Woolley, storekeeper.
M. M. Young, watchman.

Universal Atlas Cement Co., Duluth, Minn.
A. S. Hetherington, supervisor, safety and labor.

Miscellaneous
A. J. R. Curtis, Portland Cement Association.
Claud P. Dempsey, mines foreman, U. S. Bureau of Mines, Vincennes, Ind.
E. A. Grimwood, deputy labor commissioner, Des Moines, Iowa.
H. V. Hoyer, labor commissioner, Des Moines.
Earl R. Maize, Jr., mining engineer, U. S. Bureau of Mines, Vincennes, Ind.
R. H. Miller, local manager, General Electric Co.
H. E. Ransom, M.D., industrial surgeon.
W. D. Ryan, safety commissioner, U. S. Bureau of Mines, Kansas City, Mo.

New York Sand and Gravel Producers Discuss Problems

A MEETING of the Empire State Sand and Gravel Producers Association was held at the Hotel Syracuse, Syracuse, N. Y., March 12. The usual luncheon was followed by a business meeting at which a number of matters of interest to the producers were considered and discussed.

Harry R. Hayes, engineering secretary of the New York State Highway Chapter of the Associated General Contractors of America was present at the beginning of the meeting and explained the position of his association on such pending and proposed legislative measures as affect the contractors and producers.

Mr. Hayes brought out that the contractors' association is strongly in favor of the prequalification bill now pending before the state legislature, whereby bidders on public works construction would have to satisfy awarding officials as to their ability and qualifications before receipt of bids rather than after. Such a method has been successfully used for years on grade-crossing elimination contracts in the state as well as elsewhere, and in the contractors' opinion such an act would make for speedier and more satisfactory work and would be of considerable benefit to the state as well as to the construction industry.

He also stated that the contractors are opposed to any bill requiring the bonding of contractors for material, and that they are opposed to the pending bill designed to place all labor engaged on certain public works construction, chiefly grade-crossing elimination work, on an eight-hour day basis, their objection being that this bill would not only slow up this work but would increase its cost.

Mr. Hayes also mentioned the lien law amendments which they are working for, namely, an amendment penalizing wilfully exaggerated and excessive liens and against the indiscriminate filings of liens; an amendment to dissolve the lien if no action is taken within a specified time, and an amendment to permit the payment of the difference due the contractor so that all moneys are not tied up.

He further urged as an aid in reducing the excessive number of liens and the losses on highway work that the producers formulate some credit policy and set up a credit bureau through which delinquent purchasers would become known and thus be cut off from materials.

Following Mr. Hayes' talk a general discussion was engaged in covering such matters as the lien law, the bonding law (such as prevails in Pennsylvania on public improvements) and the matter of a credit bureau. The general opinion seemed to be that as matters now stand the lien law is probably as desirable as a bonding law.

The association expressed itself in favor of a closer working arrangement with the crushed-stone producers and the contractors on credits, and an effort is to be made to get at a better understanding and some more definite action at the time of the first letting at Albany the first week in April.

The meeting was then adjourned to meet again in Buffalo in May, the exact date to be announced later.

The following were present:

PRODUCERS

Albany Gravel Co., Albany, N. Y.—G. W. Maxwell, G. K. Smith, Raymond White.
Buffalo Slag Co., Buffalo, N. Y.—H. W. Vickery.
Consolidated Materials Co., Rochester, N. Y.—Henry F. Marsh.
Eastern Rock Products, Inc., Utica, N. Y.—W. D. Dodge.
Eldridge and Robinson, Inc., Auburn, N. Y.—J. W. Robinson.
Madison Sand and Gravel Corp., Hamilton, N. Y.—John G. Carpenter.
Nathan Oaks Sons, Oaks Corners, N. Y.—C. V. Oaks.
Ontario Sand and Gravel Co., Geneva, N. Y.—N. J. Roberts.
M. M. Reynolds, Ithaca, N. Y.—M. M. Reynolds.

OTHERS

C. A. Adams, General Equipment Co., Rotterdam Junction, N. Y.
A. E. Fielding, Niagara Concrete Mixer Co., Buffalo, N. Y.
B. J. Fisher, New Jersey Wire Cloth Co., New York City.
William Henderson, New Jersey Wire Cloth Co., Caledonia, N. Y.
E. C. Harsh, ROCK PRODUCTS, Chicago, Ill.
Harry R. Hayes, Associated General Contractors, Albany, N. Y.
J. L. Klug, Craine, Inc., Norwich, N. Y.
V. J. Milkowski, Morris Machine Co., Baldwinsville, N. Y.
G. D. Nolan, New Jersey Wire Cloth Co., Schenectady, N. Y.
H. F. Ritzman, Link-Belt Co., Buffalo, N. Y.
N. S. Snyder, Link-Belt Co., Buffalo, N. Y.
R. R. Strickler, Link-Belt Co., Buffalo, N. Y.
G. M. White, Good Roads Machinery Co., New York City.
S. K. Yarrington, Hendricks Manufacturing Co., Carbondale, Penn.

Basalt Rock Planning $250,000 Gravel Plant

RECENT reports indicate that the Basalt Rock Co., Inc., Napa, Calif., has plans under way for the erection of a large and modern gravel plant on the Russian river near Healdsburg. Initial investment will be $150,000, it is said, this later to be increased to $250,000. The pit to be developed is near the pits of the Russian River Gravel Co.

The Basalt company, it was said, is securing rights of way through property above the Grant pit, with a view of constructing a spur track from the Grant spur to a point opposite the gravel bars it will work, located on the north bank of the river between Fitch Mountain and Healdsburg. The plant site has not yet been decided on.—*Lakeport* (Calif.) *Press.*

Bethlehem Mines Limestone Production in 1929

THE annual report of the Bethlehem Steel Corp., Bethlehem, Penn., shows 2,168,225 gross tons of limestone produced in 1929, compared with 1,881,921 tons in 1928. The limestone operations of the Bethlehem Steel Co. are carried on by a subsidiary, the Bethlehem Mines Corp., which produces and sells commercial stone as well as furnace flux.

New York State Crushed Stone Operators Hobnob with Contractors

A MEETING and luncheon of the New York State Crushed Stone Association was held at the Hotel Syracuse, Syracuse, N. Y., March 13. A good attendance was present and the meeting was presided over by John H. Odenbach, president, and A. S. Owens, secretary.

On account of the annual convention of the New York State Highway Chapter of the Associated General Contractors of America being held at the same time and place, some of the time of those in attendance was given to the open meetings of the contractors' convention.

Some interest and discussion was aroused in a proposal introduced to the contractors by Alan Jay Parrish of the Illinois Association of Highway and Municipal Contractors, Chicago, Ill., aiming at the correction of some of the evils confronting the contractors, particularly the losses resulting from the over extension of credit and over expansion by irresponsible contractors.

Mr. Parrish also explained to the stone producers his proposal for setting up a bureau controlled jointly by the producers and the contractors, which would function to assure payment by contractors to producers for materials, and tend to eliminate irresponsible contractors.

This matter and also the pending amendments to the lien law were discussed at length, but no final action taken.

The meeting was then adjourned to meet at a date to be announced later.

Registration

The following were present:

Buffalo Crushed Stone Co., Buffalo, N. Y.—James Savage, A. J. Hooker.
Cushing Stone Co., Schenectady, N. Y.—J. E. Cushing.
Dolomite Products Co., Rochester, N. Y.—John H. Odenbach, Harvey Clark, Arthur F. Sickles.
General Crushed Stone Co., Syracuse, N. Y.—John Rice, Geo. E. Schaefer, F. C. Owens, F. F. McLaughlin, L. H. Putnam.
Jointa Lime Co., Glens Falls, N. Y.—H. J. Russell.
L. and M. Stone Co., Prospect, N. Y.—William McGrew.
LeRoy Lime and Stone Co., LeRoy, N. Y.—J. L. Heimlich.
Mohawk Limestone Products Co., Mohawk, N. Y.—Scott Wuichet.
Peerless Quarries Co., Utica, N. Y.—A. S. Owen.
Solvay Sales Corp., Syracuse, N. Y.—J. H. Kaiser, L. J. Crate.
Wickwire Spencer Steel Co., Gasport, N. Y.—W. E. Foote.

OTHERS

William Anderson, Hercules Powder Co., Buffalo, N. Y.
M. D. Caldwell, Atlas Powder Co., Rochester, N.Y.
Chas. Carruth, Contractor Equipment, Utica, N. Y.
D. L. Cheney, Marion Steam Shovel Co., Buffalo, N. Y.
*E. P. Forrestel, Associated General Contractors, Akron, N. Y.
W. J. Harrigan, Dupont Powder Co., Syracuse, N. Y.
E. C. Harsh, ROCK PRODUCTS, Chicago, Ill.
J. Shuman Hower, Contractors Equipment, Utica, N. Y.
*Louis Mayersohn, Associated General Contractors, Albany, N. Y.
*Alan Jay Parrish, Illinois Association of Highway and Municipal Contractors, Chicago, Ill.
N. S. Snyder, Link-Belt Co., Buffalo, N. Y.

*Note—Guests from Contractors Association at luncheon.

Southern California Gravel Producer Expands

THE Security Materials Co., 916 North Formosa avenue, Hollywood, Calif., recently purchased two large plants in the San Fernando valley which give the company capacity for producing 100,000 tons of rock and sand a month and makes the firm owner of 170 acres of rock deposit on which the plants are built. The two plants are known as the Kellerman plant on Big Tijunga wash in the San Fernando valley, which is principally a rock plant equipped for paving jobs and class A building work, and the Lankershim plant on Colfax avenue, adjacent to North Hollywood, which is principally a sand plant, enabling the company to specialize in sand, plaster and brick sand. Both plants were completed recently, and modern rock producing equipment was installed. With the purchase of these two plants, the Hollywood firm enters the rock producing field, in addition to handling a well rounded line of building materials, such as reinforcing steel, lime, plaster, metal lath, expansion joints, wallboard and general building specialties. In 1929 the Security Materials Co.'s sales amounted to more than $2,000,000, and the volume of business done during 1930 is expected to exceed that figure. The firm was organized in 1926. The directors include Charles E. Seaman, president; V. S. Hoy, vice president; Fletcher White, secretary; Chalmer C. McWilliams, treasurer; Kennedy Ellsworth, manager, and George H. Yardley, Jr., and Leonard E. Harbach, Jr. In addition to the offices and warehouse at Hollywood, the firm maintains a branch warehouse at Los Angeles.—*Hollywood* (Calif.) *News*.

New District Engineer for National Sand and Gravel Association

D. D. McGUIRE, engineer of tests in the Tennessee state highway department, has tendered his resignation, effective April 1, to become associated with the National Sand and Gravel Association as district engineer, with headquarters in St. Louis, Mo. Mr. McGuire went to the Tennessee department four years ago from the Illinois highway department.

Universal-Atlas Makes New Appointments

THE Universal Atlas Cement Co., Chicago, Ill., announces the following changes in its personnel. E. D. Barry, superintendent of the plant at Universal, Penn., is appointed assistant operating manager with headquarters at Chicago; J. C. Witt, chemical engineer, is transferred from the Buffington, Ind., plant to Chicago. R. L. Slocum has been promoted from assistant to general superintendent of the Universal, Penn., plant, and H. H. Lauer, engineer, Atlas division, has been appointed assistant chief engineer. T. A. Hicks is appointed general chemist.

Seattle Gypsum Mill to Expand

A $150,000 PROGRAM which will increase the output of its plant is announced by George O. Gray, president and general manager of the Gypsum Products Corp., Seattle, Wash.

Plans are also under way for extending the field for markets, following the completion of the improvement to the plant. The company at present covers all the territory west of the Dakotas and Colorado, and it also ships extensively to foreign countries. Virtually half the product of the factory is sent out of American territory.

New Oregon Gravel Operation

A MOUNTAIN of pure, clean sand has been discovered near Klamath Falls, Ore., by L. K. Porter of the Porter Construction Co., of that city, and equipment has been placed for sluicing, washing, dewatering and loading on to barges. The bank borders the Williamson river, which flows into Upper Klamath Lake 25 miles north of Klamath Falls. Barges will be taken down the river and lake to a landing in the city where the sand will be loaded on trucks and brought to a classifying and storage plant for distribution.

A new company, the General Sand and Gravel Co., has been formed to operate the sand plant and take over the material business, formerly handled by the Porter Construction Co. Mr. Porter, who is president of the construction company, is also president of the new sand company.

In this country of lots of sand, both in the soil and in its people, there is very little high grade sand for building purposes and the discovery of this river deposit assures the builders of Klamath county a plentiful supply of the highest grade concrete and mason sand obtainable anywhere. (We got this first hand.—Editor!)

Senators Put Joker in Cement Tariff

THE United States Senate, upon the motion of Senator Blease of South Carolina, put a joker in the previous senate resolution in favor of a 6c per 100 lb. duty on imported portland cement, by adopting, 42 to 37, an amendment placing cement to be used by or sold to state, county or municipality on the free list. A motion by Senator Kean of New Jersey to reconsider this action was voted down, 43 to 38. The adoption of the joker followed attempts of the coalition of Democrats and so-called Republican independents to reconsider the sugar and cement tariff action.

Penn.-Dixie Cement to Enlarge Iowa Mill

PLANS of the Pennsylvania-Dixie Cement Corp. to spend $175,000 on the Pyramid plant, west of Valley Junction, Iowa, were announced recently by R. A. Bechtold, general superintendent of the company.

Contracts for the building of two new additions to the present plant, one being a four-story structure, 40 ft. by 82 ft., and the other a one-story building, 120 ft. long by 80 ft. high. The contract has been given to the Burrell Engineering and Construction Co., Chicago. The four-story building will be used for packing cement, sorting, tying and counting sacks. This new building will double the storage capacity of the present plant. E. Grothe, engineer, of Chicago, and Karl Katsburg, the local plant's engineer, have planned that twenty-four hour days will be used and the job will be completed in seventy-five days. The new buildings are to be of concrete.

The city officials of Winterset will be the guests of the officials of the Penn.-Dixie company in the near future, Superintendent Bechtold announced. The purpose of the meeting is to propose plans for leasing additional lime quarries in and around Winterset. This party will be in the form of a dinner at the Hotel Savery.—*Valley Junction* (Iowa) *Booster*.

Indiana Limestone Company to Build $1,000,000 By-Products Plant

THAT the Indiana Limestone Co. is planning to build a plant at the cost of approximately $1,000,000 somewhere in the Bloomington-Bedford district was revealed recently by Lawrence Whiting, chairman of the board of directors of the company, in a speech at a banquet given in his honor at the Graham hotel, Bloomington, Ind. The new plant will be used to utilize the waste materials of the industry by the manufacture of by-products. The exact location of the plant and time of erection have not been decided.

The new plant will be part of a program which the company is contemplating, which will involve the expenditure of several millions of dollars in the Bloomington-Bedford area. The company at present has approximately $40,000,000 invested in plants and rock deposits in the area.

The production of the company for the first six months of the present fiscal year has been the most profitable in the history of the company. The stone industry is becoming an acknowledged outstanding leader in the business field, Chairman Whiting said. "I have a very optimistic outlook that Bloomington will profit beneficially by the growth of the stone industry," he added.—*Bloomington* (Ind.) *World*.

Chicago Gravel Company Adds to Holdings

THE Chicago Gravel Co., Chicago, Ill., added to pit facilities through the purchase of an 83.9-acre tract in the southwest corner of Hanover township in Cook county for development as a gravel producing source. The price was not disclosed.

Florida Cement to Panama

THE first unit of a 9000-ton shipment of Florida Portland Cement Co. cement left Tampa, Fla., recently on the Danish freighter *Brosund* for Cristobal and Panama City, Panama. It is the largest cement shipment by water that has been made from the Tampa plant.

The cargo includes 10,000 sacks consigned to private concerns of Panama for use in commercial work, and 80,000 sacks to the United States government for construction work on the Panama canal. Officials of the company anticipate the shipment for general commercial work among Panama builders will open a new field and create a demand for the Florida product in an active Latin-American market.—*Tampa* (Fla.) *Tribune.*

New High-Early-Strength Cement for West Coast

AFTER seven years of technical and scientific research at its laboratories in Concrete, Wash., Superior Portland Cement Inc., has developed a new product—a cement that gives full 28-day strength in three days. This high-early-strength cement has just been placed on the market in western and central Washington.

This new type cement has been tested in every type of construction during the past two years. It has been used in industrial plants, warehouse floors, on new paving work, on pavement patching and similar work. The new cement meets the requirements of the state highway department.

Rock Products Operations of the Steel Corporation

ACCORDING to the annual report to stockholders of the United States Steel Corp., the corporation produced 14,763,412 tons of limestone, dolomite and fluorspar in 1929 compared with 14,600,181 tons in 1928 —an increase of 1.1%. The subsidiary, the Universal Portland Cement Co., produced 11,549,000 bbl. in 1929 compared with 14,957,000 bbl. in 1928—a decrease of 22.8%. Shipments of portland cement were 12,234,733 bbl. in 1929 and 14,555,064 bbl. in 1928, a decrease of 15.94%.

Regarding the acquisition of the Atlas Portland Cement Co. by the Universal company the report states:

"During the year the corporation after extended negotiation and investigation entered into contracts for the purchase of the properties, assets and business of the Atlas Portland Cement Co. The property was transferred to the corporation in January, 1930, and payment was made for same wholly in shares of common stock of United States Steel Corp., 176,265 shares having been delivered. The total cash value of the properties, assets and business of the company acquired as stated was appraised by the corporation at not less than $31,137,000.

"The Atlas Portland Cement Co. owned and operated six cement plants located at Northampton, Penn., Hudson, N. Y., Hannibal, Mo., Leeds, Ala., Independence, Kan., and Waco, Texas with many years supply of raw material for manufacture of cement located contiguous to these plants. The plants have an annual capacity of 18,000,000 bbl. The plants, it will be observed, are all located in and serve territories almost wholly far removed from the territories (Pittsburgh, Chicago and Duluth) in which are located the cement plants previously controlled by the corporation. The acquisition of the Atlas plants, accordingly, broadens widely the territory served by the corporation in the marketing of cement and without in any appreciable degree enlarging its product available for distribution in territory heretofore supplied. The Atlas Portland Cement Co. was one of the oldest producers of cement in the United States, and its brands and service are highly esteemed by consumers."

Southwestern Cement to Have Model Ohio Farm

AN appropriation of $30,000 has been made for the operation this year of the model farm here of the Southwestern Portland Cement Co., Osborn, Ohio, under the direction of W. J. Jennings, general manager. The farm is to be devoted to scientific farming and stock raising.—*Xenia* (Ohio) *Herald.*

New Cement Plant for Argentina

JUAN MINETTI has plans for a new cement plant of 7500 bbl. daily capacity at Cordoba, Argentine. Deposits of clay and limestone are located nearby. Raw material will be hauled to the plant by use of a cableway two miles long, handling 25 tons per hour, this to be installed by Adolf Bleichert and Co.—*Zement.*

Beg Your Pardon!

THE article in ROCK PRODUCTS, March 15, 1930, p. 47, "Portland Cement Industry on the Pacific Coast" gave the size of the Traylor compartment mill at the Blue Diamond grinding plant as 11 x 50 ft. This should be 7 x 50 ft.

Ohio Valley Sand Co. Sold to McClain Company

PURCHASE by the McClain Sand Co. of Morgantown, W. Va., and Point Marion, Penn., of the Ohio Valley Sand Co., Inc., of New Martinsville, W. Va., is announced by officials of the company. The acquisition of the Ohio Valley company will approximately double the production of the McClain company and give it a consolidated output of sand and gravel of about 3000 tons daily. The Ohio company has been operating at New Martinsville for about eight years.

The consolidated organization will have for its president J. C. McClain of Uniontown, Penn.; F. L. Bowers of Point Marion as secretary and treasurer. Joseph P. Lucas of Morgantown will be general sales manager; J. W. Harmon of New Martinsville will be office and sales manager at that point; T. M. Bowers of Point Marion will be superintendent at New Martinsville; T. F. Lucas will be superintendent at Morgantown and I. J. Jenkins superintendent at Point Marion.

The combined assets of the company will be more than a half million dollars, it is stated. It will operate three river boats on the Monongahela and two on the Ohio river and will have about 100 sand and gravel barges and boats of steel construction.

The Ohio Valley company, which will retain its present name, will continue to take its material from the bed of the Ohio river, while the McClain company will continue to dredge the Cheat river near Point Marion.—*Morgantown* (W. Va.) *Dominion News.*

Aetna to Install Slurry Filters

THE Aetna Portland Cement Co., Bay City, Mich., will install American type slurry filters, of the Oliver-United Filters, Inc., according to report. This plant has 11 by 175 ft. kilns and a waste-heat plant.

Indiana Limestone Producers Organize

THE formation of a new and promotional association in the interests of the quarry producers of the oolitic limestone industry of Indiana was announced recently in the Chicago building material trade. It is to be known as the Building Stone Association of Indiana and is to be organized along the same lines of the Indiana Limestone Quarrymen's Association which was dissolved several years ago.

Headquarters of the new organization will be in Bloomington, Ind., in the heart of the limestone quarrying district of that state. J. L. Terphy is president, J. G. Ray is vice-president and acting chairman of the board of directors. H. S. Brightly, formerly technical director of the Indiana Limestone Quarrymen's Association, will serve as the active head of the association.

New Tennessee Crushed Stone Company

RALPH E. McLEAN, former president of the East St. Louis Stone Co., East St. Louis, Ill., announces that with his son, Morris E. McLean, he is again actively engaged in the crushed stone industry. The Big Harpeth Quarries, Inc., has been purchased and its charter surrendered to provide for a new company, the McLean Stone Co., Newsom Station, Tenn. These quarries were formerly operated by J. B. Ezzel, and are on the west side of the N. C. and St. L. railroad near the Harpeth river, Nashville, Tenn. A reported price of $42,500 was paid for the 38.7 acre tract.

Contracts have already been placed by Mr. McLean for the crushing machinery and a 360-hp. Fairbanks - Morse Diesel engine, which will be used to drive an electric generator supplying the plants power requirements. The headquarters of the new company will be at Nashville, Tenn.

Another Crushed Stone Producer to Make Gravel Also

THE ranks of aggregate producers whose interests include both sand, gravel and crushed stone production are constantly growing. Now news comes from Rochester, N. Y., that John H. Odenbach, president of the Dolomite Products Co., and president of the New York Crushed Stone Association, will soon be in the sand and gravel business with a plant near Rochester, which every friend of Mr. Odenbach's believes will be as much a departure of current sand and gravel plant design as are his very efficient crushed stone plants from previous crushed stone plant design and practice. The new plant will have a capacity of about 1200 tons per day.

Georgia Granite Plant Rebuilt

WORK of reconditioning the machinery of the Georgia Quincey Granite Co., Granite Hill, near Sparta, Ga., has been completed. Since January, Messrs. Bailey and Stewart, the new owners, have been working a force of mechanics on the plant getting it ready to operate.

The old machinery was taken out and new put in so they are now ready to crush stone for road building and concrete work at the rate of ten carloads daily.

The new owners plan to keep the quarry busy with the orders they have and business they expect to secure over this and other states.

The Sparta Lions Club is sponsoring the use of Hancock county crushed stone for road building in this section of Georgia. The club has received assurance from Chief Engineer McWhorter, of the state highway department, that much of this stone will be used if the local quarry owners are able to furnish it in large quantities. The new plant just opening up can do this so it is probable that they will get much of this business during the next few years.—*Augusta* (Ga.) *Chronicle*.

Eugene Enloe Named President of Idaho Portland

EUGENE Enloe, Spokane capitalist, was elected president of the Idaho Portland Cement Co., Inkom, Idaho, at a recent meeting of the directors. He succeeds E. J. Simons, founder of the company, who asked to be relieved because of his inability to further give the position the time that it requires and at the same time care for his other business interests. Mr. Enloe is one of the heavy stockholders of the company and has been an active member of the board.

J. B. Maxfield

J. B. Maxfield, vice-president of the company, and with it since its inception, was elected general manager and placed in entire charge of all the business of the company. Additional equipment is to be placed in the plant soon and plans for the erection of a local cement products plant are being worked out, according to Mr. Maxfield.—*Spokane* (Wash) *Spokesman-Review*.

Arkansas Portland to Install Slurry Filters

THE Arkansas Portland Cement Co., Okay, Ark., will install new machinery in its plant, including filter operating on 300-ft. rotary kiln, increasing capacity to 2750 bbl. daily, and grinding or finishing mill to double plant's capacity at this stage of manufacturing. The American type filter of the Oliver-United Filters, Inc., was selected.

Universal Atlas Cement Co. to Build Milwaukee Packing Plant

FURTHER evidence of confidence in Milwaukee's future business outlook is contained in details made public March 18 of plans for the expenditure of approximately $500,000 on a cement distribution plant here.

The project is planned by the Universal Atlas Cement Co., Chicago, a subsidiary of the United States Steel Corp., and is to be carried out on a waterfront site in the Menomonee valley, at Sixth and Canal streets.

It embraces construction of six to ten storage tanks and a large steel constructed building. Bids are already being taken, it is understood, and completion is expected early this summer.

This will give Milwaukee its fourth group of large cement storage tanks. The Universal Atlas tanks each will be 24 ft. in dia. and 62 ft. high, with aggregate storage capacity of between 75,000 and 80,000 bbl. of bulk cement. The additional building will be for sacked cement, and sack storage, elevator equipment and plant offices.

Heretofore the company's product has been sent here by rail. When the proposed improvements have been completed, cement will be shipped by water from the concern's plant, where new docks were recently completed, at Buffington, Ind. This will result in substantial savings in transportation costs, it was pointed out.

Cement will be sacked here, available for distribution by truck and rail. Boyd Clarke is the local representative of Universal Atlas Cement Co.—*Milwaukee Sentinel*.

Air Receiver Explosion at Western Quarry

FAILURE of the safety valve on the air receiver to function is attributed as the cause of the recent explosion of a large air receiver at the Western Quarry, Tenino, Wash. Although a number of men were working nearby, there were no injuries or fatalities. The damage was said to be slight. —*Tenino* (Wash.) *Independent*.

Radford Limestone Corp. Sold to Power Company

PURCHASE of the Radford Limestone Corp. of Roanoke, Va., by the Appalachian Electric Power Co. was announced recently. The quarries are in Pulsaki county at the junction of the Little river and New river and two miles below the site of the Appalachian's proposed $11,000,000 hydroelectric development on New river.

Although it had been reported that between $600,000 and $800,000 was paid for the quarry property, John S. Draper of Pulaski, attorney for the Appalachian Power company, said the price was considerably below these figures.—*Danville* (Va.) *Bee*.

Nebraska Contractors and Dealers Agreement on Cement Sales Terms*

A DEFINITE agreement on schedules of service and compensation and other stipulations covering the sale of cement in quantity lots has been established through joint action of the Nebraska Chapter of the Associated General Contractors of America and the Nebraska Lumber Merchants Association, following a meeting January 8 of committees of contractors from the A. G. C. chapter and from the lumber association.

Schedules Agreed On

All of the schedules and stipulations were based on carload purchases, all amounts less than a carload being regarded as retail purchases and not governed by these rules. It was agreed that the period in which the contractor would receive a cash discount for prompt payment would be 30 days, that is, the contractor would pay every 30 days all that he owed on that date, both for material received 30 days before and for that received the day before, making the average period for paying for material 15 days after the purchase.

It is further stipulated that the contractor is to exert his best influence to prevent the issuance of credit memoranda by the mill to the dealer in lieu of cash. The contractor is to have the right to choose the brand of cement to be furnished for his use when purchase is by carload lot. In cases where controversy arises between the dealer and the contractor the controversy shall be brought to the attention of the secretary of the Nebraska Chapter of the A. G. C. and the secretary of the Nebraska Lumber Merchants Association, who will settle such controversy.

Compensation According to Classification of Service

Three classifications of service and compensation covering the conditions under which cement will be purchased for highway paving were drawn up. They are:

Five cents per barrel to the dealer when the purchase is made through the dealer, the dealer and contractor each to get a copy of invoice, the contractor to pay the freight and pay the invoice and the contractor to take 10c per bbl. cash discount for prompt payment.

Seven and one-half cents per barrel to the dealer where purchase is made through the dealer, the dealer to pay the freight between monthly estimate dates, the contractor to pay the invoice to the mill and take 10 cents per bbl. cash discount for prompt payment.

Ten cents per barrel to the dealer where purchase is made through the dealer, the dealer to pay the freight and pay the invoices between the 30 day estimate dates, the contractor to take 10 cents per bbl. cash discount if he pays the dealer promptly each 30 days.

On the compensation arranged for service for all bridge and culvert work and municipal paving and street work except state highway paving the regulations provide that as there are many varying circumstances which may make the fixed rate inadequate as compensation to the dealer for his services, the contractor and dealer are to agree between them on an equitable additional compensation to the dealer.

The provision for this type of service is: Ten cents per bbl. to the dealer with the purchase made through the dealer, the dealer to place available storage facilities at the disposal of the contractor for two or three carloads, the dealer to ship bags baled by the contractor and the contractor to pay the dealer freight and invoice at 30 day intervals according to the monthly estimate days, and the contractor to have the 10 cents per bbl. cash discount for prompt payment.

*From the March issue of *The Constructor*.

Editorial Comment

COMMENTING on the news item herewith, "The Constructor" says, editorially, in part: "The contractors and dealers of Nebraska are to be complimented for the pioneering work that they have done in bringing the questions concerning merchandising procedure out into the open. Probably the schedules agreed upon are not accepted as the best possible arrangement by all the members of each group. Nevertheless the step is one in the right direction and if followed regionally and nationally will result in the establishment of fair and workable merchandising policies where chaotic and non-uniform policies have to date been detrimental to all concerned.

"The viewpoint that the contractor should have no voice in the merchandising procedure set up by agreement between manufacturer and dealer, as well as the viewpoint that the dealer serves no function in the sale of a material shipped direct by manufacturer to contractor, both require modification. So does the viewpoint that the merchandising plan of a manufacturer is outside the province of both the dealer and the contractor. All three groups are vitally concerned and it is becoming increasingly evident that the way toward the development of a sound merchandising structure is through joint discussions, joint action, and joint observance of the rights of all three groups, with a constant view toward the benefit of the industry as a whole."

Cincinnati Sand and Gravel Producers Organize with Contractors and Dealers

A NEW division of the Allied Construction Industries, Cincinnati, Ohio, to be known as the Cincinnati Sand and Gravel Producers' Association, has been organized.

Seven firms, comprising the majority of the producers of aggregate in greater Cincinnati, are charter members of the new division. They are American Aggregates Corp., William H. Barber, J. N. Dugan, T. J. Hall, Queen City Crushed Stone and Sand Co. and the Western Hills Sand and Gravel Co., Inc. Although the American Aggregates Corp. has been a member of the association for some time, the other six in the division are new members.

At the organization meeting the following officers were elected: President, J. N. Dugan; vice president, B. T. Van Camp, of the Van Camp Sand and Gravel Co.; secretary-treasurer, Earl P. Holwadel, of the American Aggregates Corp.

The members voted to authorize the president to represent them on the board of directors of Allied Construction Industries, while W. A. Jurgensen, of the American Aggregates Corp. was elected to represent the division on the credit board. Regular meetings of the division are to be held the first and third Tuesday of every month.

A committee composed of Mr. Van Camp, William H. Barber and Fred W. Cornuelle was appointed by the president to study the proposed building code of Cincinnati soon to be adopted by the city council.

With the addition of the Cincinnati Sand and Gravel Producers' Association there are now fifteen duly constituted divisions affiliated with Allied Construction Industries. All divisions have been authorized by the board and will co-operate with the association in the furtherance of the program of activities which it is undertaking. The new division will aid materially by adding greater strength to the credit stabilization plan of the association, it is claimed.

Building Material Profits in 1929

SUMMARIZING corporation profits in 1929 the National City Bank, New York City, says in its monthly bulletin:

"Classification of concerns supplying building materials is difficult because of the diversity of products that are used in new construction. Taking the basic materials such as cement, stone, gravel, brick, tile and glass, together with numerous 'building specialties' such as roofing, asbestos, etc., the reports of 26 companies showed combined earnings in 1929 equal to 1928 but below 1927, and the showing would be less favorable were it not for the fact that increased earnings of a few specialty companies tend to offset the decreased earnings of producers of basic materials such as cement and brick."

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.48	.48	1.15	1.25	1.40	......
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.25	1.15	1.75	......	1.75	1.75
Buffalo, N. Y.	1.00	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.70	.95	1.40	1.40	......	......
Machias Junction, N. Y.	.75	.75	.75	......	.75	.75
Milton, N. H.	......	......	1.75	......	1.25	1.00
Montoursville, Penn.	1.00	.70	.60	.50	.50	.40
Northern New Jersey	.35- .50	.35- .50	1.25	.90-1.25	.90-1.25	......
South Portland, Me.	......	1.00	2.25	......	......	......
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Appleton, Minn.	......	.50	1.25	......	1.50	......
Attica, Ind.			All sizes .75-.85			
Barton, Wis.	......	.40d	.50d	.60d	.60d	.60d
Algonquin, Ill.	.60	.30	.30	.40	.40	.40
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Des Moines, Iowa	.40- .60	.60- .80	1.50-1.70	1.50-1.70	1.50-1.70	1.50-1.70
Eau Claire, Wis.	......	.55	.70	1.00	1.00	......
Elkhart Lake and Glenbeulah, Wis.	.40	.40	.60	.60	.60	.60
Grand Rapids, Mich.	.50	.50	.70	.80	.80	.70
Hamilton, Ohio	.65- .75	65.- .75	.65- .75	.65- .75	.65- .75	.65- .75
Hersey, Mich.	......	.50	......	.70	.70	.70
Humboldt, Iowa	.40	.40	1.25	1.25	1.25	1.25
Indianapolis, Ind.	.50.- .60	.25- .60	.40- .60	.45- .75	.45- .75	.45- .75
Kalamazoo, Mich.	1.00	.50	.50	.60	.65	.75
Kansas City, Mo.	.70	.70	......	......	......	......
Mankato, Minn.	.55	.45	1.25	1.25	1.25	......
Mason City, Iowa	.50	.50	.80	1.25	1.25	1.25
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.35	.35	1.25	1.35	1.35	1.25
St. Paul, Minn. (e)	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	......	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.00	1.00
SOUTHERN:						
Charleston, W. Va.	.70	1.25	1.25	......	......	......
Eustis, Fla.	......	.40- .50	......	......	......	......
Fort Worth, Texas	.75	.75	1.00	1.00	1.00	1.00
Knoxville, Tenn.	.85	1.00	1.20	1.20	1.20	1.20
Roseland, La.	......	.30	1.25	.80	.80	.80
WESTERN:						
Los Angeles, Calif.	.10- .40	.10- .40	.20- .90	.50- .90	.50- .90	.50- .90
Oregon City, Ore.	3.00-3.50g	1.00-1.50	1.00-1.50	1.00-1.50	1.00-1.50	1.00-1.50
Phoenix, Ariz. (c)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.70	.60	1.15	1.20	1.15	1.15
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (c) 60-70% crusher boulders. (d) Plus 15c for winter loading. (e) Prices f.o.b. N. P. Ry.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.85	......	......	4.00	......
Cheshire, Mass.		Sand for soap, 7.00-8.00				6.00-8.00	......
Eau Claire, Wis.	......	......	......	......	......	2.50-3.00	......
Elco, Ill.	Soft amorphous silica, 92%-99% thru 325 mesh, 18.00-40.00 per ton						
Franklin, Penn.	1.75	1.75	......	......	......	......	......
Kasota, Minn.	......	......	......	......	......	......	1.50
Montoursville, Penn.	......	......	......	1.35-1.60	......	......	......
New Lexington, Ohio	2.00	1.50	......	......	......	......	......
Ohlton, Ohio	1.75*	2.00*	......	2.00*	1.75*	1.75*	......
Ottawa, Ill.	1.25-3.25	2.25-3.50	1.25-3.25	1.25-3.25	1.25	3.50	3.50
Red Wing, Minn. (a)	......	......	......	......	1.50	3.00	1.50
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50-3.50†	5.00†	3.50-5.00†	......

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	......	1.50
Eau Claire, Wis.	4.30	1.00
Franklin, Penn.	......	1.75
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25-3.25	1.25
Red Wing, Minn.	......	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	......	1.75

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. plant.

Cheshire, Mass., in carload lots	5.00-7.00
Franklin, Penn.	2.25
Klondike, Mo.	2.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00-5.00
Silica and Mendota, Va.	2.50-3.00

Bank Run Sand and Gravel

Prices given are per ton, f.o.b. producing plant or nearest shipping point.

Appleton, Minn.†	.55
Algonquin, Ill.¶ (½-in. and less)	.30
Brewster, Fla. (sand, ¼-in. and less)	.40- .50
Burnside, Conn. (sand, ¼-in. and less)	.75*
Chicago, Ill., and Grand Haven, Mich.†	.92-1.20
Des Moines, Ia. (sand and gravel mix)	.60-1.05
Fort Worth, Tex.¶ (2-in. and less)	.65
Gainesville, Tex.¶ (1-in. and less)	.55
Gary and Miller, Ind.†	1.15-1.40a
Grand Rapids, Mich.¶ (2-in. and less)	.50
Hamilton, Ohio¶ (1½-in. and less)	.50-1.00
Hersey, Mich.¶ (1-in. and less)	.50
Mankato, Minn.†	.70
Oregon City, Ore.—All sizes at bunkers	1.00-1.50
Pueblo, Colo.—†River run sand	.50
Seattle, Wash.—Sand, 1/10-in. down, .25*; ¼-in. and less, same; gravel in sizes ranging from 2-in. and less to ½-in. and less	.25*
Winona, Minn.†	.60
York, Penn. Sand, ¼-in. and less, 1.00; 1/10-in. down	1.10

*Cubic yard. †Fine sand, 1/-10-in. down. (a) Cu. yd., delivered Chicago. ¶Gravel.

Current Price Quotations

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.91¼	3.05	4.30¶
Atlanta, Ga.	......	1.99	3.49¶
Baltimore, Md.	......	2.26	3.56¶
Berkeley, Calif.	......	2.14	......
Birmingham, Ala.	......	1.65	3.15¶
Boston, Mass.	.57	1.78-1.88	3.27¶
Buffalo, N. Y.	.61¼	1.95-2.05	3.35¶
Butte, Mont.	.90¼	3.61	......
Cedar Rapids, Ia.	......	2.03-2.16	2.99f
Centerville, Calif.	......	2.14	......
Charleston, S. C.	......	2.09a	3.26¶
Cheyenne, Wyo.	.71½	2.26	......
Chicago, Ill.	......	1.75	3.25¶
Cincinnati, Ohio	......	1.92-1.94	3.44¶
Cleveland, Ohio	......	1.84	3.34¶
Columbus, Ohio	......	1.92-1.97	3.47¶
Dallas, Texas	......	1.65	3.14¶
Davenport, Iowa	......	1.94-2.04	
Dayton, Ohio	......	1.94	3.44¶
Denver, Colo.	.63¾	2.55	
Des Moines, Iowa	.48½	1.94	2.99f
Detroit, Mich.	......	1.75	3.25¶
Duluth, Minn.	......	1.84	......
Fresno, Calif.	......	2.33	......
Houston, Texas	......	1.75	3.38¶
Indianapolis, Ind.	.54¾	1.79	f3.19-3.29¶
Jackson, Miss.	......	2.09-2.29	3.59¶
Jacksonville, Fla.	......	2.14b	3.26¶
Jersey City, N. J.	......	2.13	3.43¶
Kansas City, Mo.	.48	1.92	f3.22-3.22¶
Los Angeles, Calif.	.36½	1.46	......
Louisville, Ky.	.55½	1.92	f2.92-3.42¶
Memphis, Tenn.	......	2.09-2.29	f3.55-3.59¶
Merced, Calif.	......	2.01	
Milwaukee, Wis.	......	1.90	3.40¶
Minneapolis, Minn.	......	2.07	......
Montreal, Que.	......	1.60‡	......
New Orleans, La.	.43	1.82	3.22¶
New York, N. Y.	.60¾	1.93-2.03	3.33¶
Norfolk, Va.	......	1.87-1.97	3.27¶
Oklahoma City, Okla.	.59	2.36	3.66¶
Omaha, Neb.	.56½	2.26	3.56¶
Peoria, Ill.	......	1.92	3.32¶
Pittsburgh, Penn.	......	1.75	3.25¶
Philadelphia, Penn.	......	2.15	3.45¶
Phoenix, Ariz.	......	3.51	......
Portland, Ore.	......	2.30	......
Reno, Nev.	......	2.76	
Richmond, Va.	......	2.16-2.32	3.62¶
Sacramento, Calif.	......	2.25	......
Salt Lake City, Utah	.70¼	2.81	......
San Antonio, Texas	......	......	3.42¶
San Francisco, Calif.	......	2.04	......
Santa Cruz, Calif.	......	2.10	......
Savannah, Ga.	......	2.09a	3.16¶
St. Louis, Mo.	.48¾	1.75	f3.00-3.25¶
St. Paul, Minn.	......	2.07	......
Seattle, Wash.	......	1.90	f2.85
Tampa, Fla.	......	1.80	3.41¶
Toledo, Ohio	......	2.00-2.03	3.50¶
Topeka, Kan.	.52¾	2.11	3.41¶
Tulsa, Okla.	.55¾	2.23	3.53¶
Wheeling, W. Va.	......	1.92-2.02	3.32¶
Winston-Salem, N. C.	......	2.14	3.54¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

Albany, N. Y.	......	2.15	......
Bellingham, Wash.	......	2.25	......
Buffington, Ind.	......	1.70	......
Chattanooga, Tenn.	......	2.05	......
Concrete, Wash.	......	2.65	......
Davenport, Calif.	......	2.05	......
Hannibal, Mo.	......	1.90	......
Hudson, N. Y.	......	1.75	......
Leeds, Ala.	......	1.65	......
Lime & Oswego, Ore.	......	2.40	......
Mildred, Kan.	......	2.35	......
Nazareth, Penn.	......	2.15	......
Northampton, Penn.	......	1.75	......
Richard City, Tenn.	......	2.05	......
Steelton, Minn.	......	1.85	......
Toledo, Ohio	......	2.20	......
Universal, Penn.	......	1.70	......

NOTE: With exception of prices for "Incor" and "Velo" cement, prices quoted are net prices, without charge for bags, and all discounts deducted. Add 40c per bbl. for bags. (a) 44c refund for paid freight bill. (b) 38c bbl. refund for paid freight bill. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. ‡Includes sales tax.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Farmington, Conn.	....	1.30	1.10	1.00	1.00	....
Ft. Spring, W. Va.	.35	1.35	1.35	1.25	1.15	1.10
Jamesville, N. Y.	.60	1.00	1.00	1.00	1.00	....
Oriskany Falls, N. Y.	.50–1.00	1.00–1.35	1.00–1.35	1.00–1.35	1.00–1.35	1.00–3.00
Prospect Junction, N. Y.	.50– .80	1.15u	1.15	1.10	1.10	1.10
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Shaw's Junction, Penn. (e)	.85	1.20–1.35	1.20–1.35	1.20–1.35	1.40	1.30–1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill. (b)	1.85	....	1.85	....	....	....
Cypress, Ill.	1.15	1.10	1.00	1.15	1.15	1.20
Davenport, Iowa	1.00	1.50	1.50	1.30	1.30	1.30
Dubuque, Iowa	1.00	1.00	1.20	1.10	1.10	....
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	....
Greencastle, Ind.	1.25	1.10	1.10	1.00	1.00	1.00
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
McCook, Ill.	.90	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.75–1.00	1.65–1.85	1.45	1.15	1.05	.95
Sheboygan, Wis.	1.00	1.00	1.00	1.00	....	....
Stone City, Iowa	.75	....	1.10	1.00	1.00	1.00h
Toledo, Ohio	1.60	1.70	....	1.60	....	1.60
Toronto, Canada (i)	2.70	2.70	2.50	2.50	2.50	2.50
Waukesha, Wis.	....	.90	.90	.90	.90	....
Wisconsin points	.50	....	1.00	.90	.90	....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Chico and Bridgeport, Texas	.50	1.30	1.30	1.25	1.20	....
Cutler, Fla.	.50– .75r	....	....	1.75r	....	1.10g
El Paso, Texas	.50– .75	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	.50–1.00	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45
Stringtown, Okla.	.50	1.30	1.30	1.25	1.20	....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Duluth, Minn.	.90–1.00	2.25	1.75	1.75	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	....	2.00	1.45	1.20	1.15	....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.40	1.40	1.40–1.80	1.40–1.50	1.40	....
Richmond, Calif.	.70	....	1.00	1.00	1.00	....
Toronto, Canada (i)	4.70	5.80	....	4.05	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.50	....	1.75	1.75	1.60	....
Chicago, Ill.—Granite	2.00	1.70	....	1.50	1.50	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	....	....	2.25–2.50s	....	....	....
Lithonia, Ga.—Granite	.50	1.60	1.35	1.25	1.15	....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.—Granite	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
Richmond, Calif.—Quartzite	.75	....	1.00	1.00	1.00	....
Toccoa, Ga.—Granite	.50	1.35	1.35	1.25	1.25	1.20

(a) Limestone, ¼ to ⅛ in., 1.35 per ton; Lime flour, 8.50 per ton. (b) Wagonloads. (c) 1 in., 1.40. (d) 2-in., 1.30. (e) Price net after 10c discount deducted. (g) Per cu. yd., 3-in. and less. (h) Rip rap. (i) Plus 25c per ton for winter delivery. (n) Ballast, R.R., .90; run of crusher, 1.00. (q) Crusher run, 1.40; ¾-in. granlithic finish, 3.00. (r) Cu. yd. (s) 1-in. and less, per cu. yd. (t) Rip rap, 1.20–1.40 per ton. (u) ⅝-in. and less.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Allentown, Penn.	1.00–1.50	.40– .60	.80–1.00	.50– .80	.50– .80	.60– .80	.80
Bethlehem, Penn.	1.25–1.75	.50– .70	1.00–1.25	.60– .80	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.25–1.75	.60	.90	.60– .90	.60– .90	.60– .90	....
Reading, Penn.	2.00	1.00	....	1.00	....	....	....
Swedeland, Penn.	1.50–2.50	.60–1.10	1.00–1.25	.90–1.25	.90–1.25	1.25	1.25
Western Pennsylvania	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	....	1.30*	1.80*	1.55*	1.55*	1.45*	....
Jackson, Ohio	....	1.05*	1.80*	1.45*	1.30*	1.30*	....
Toledo, Ohio	1.50	1.10	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	....	1.05*	1.80*	1.45*	1.45*	1.45*	....
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*	....	1.15*	.90*	.90*	....

5c per ton discount on terms. †1¼ in. to ¼ in., 1.05; ⅝ in. to 10 mesh, 1.25*; ⅜ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$; 0% $MgCO_3$, 90% thru 100 mesh	4.50
Belfast, Me.—Analysis, $CaCO_3$, 90.4%; $MgCO_3$, trace; 90% thru 100 mesh, per ton	10.00
Branchton, Penn.—94.89% $CaCO_3$; 1.50% $MgCO_3$, 100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh; per ton	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton	6.00
Gibsonburg, Ohio—Bulk, 2.25; in bags	3.70
Joliet, Ill.—Analysis, 50% $CaCO_3$; 44% $MgCO_3$; 90% thru 200 mesh	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk	2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.50
Olive Hill, Ky.	2.00

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; ½% $MgCO_3$; 90% thru 10 mesh	1.50
Chico and Bridgeport, Texas—Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh	1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder	3.50
Cypress, Ill.—Analysis, 96% $CaCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.25; 90% thru 50 mesh, 1.20; 50% thru 50 mesh, 90% thru 4 mesh and 50% thru 4 mesh, all	1.10
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton	1.10
Dubuque, Ia.—Analysis, 34.96% $CaCO_3$; 59.62% $MgCO_3$; 90% thru 4 mesh	.95
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh	1.50
Gibsonburg, Ohio—90% thru 10 mesh	1.00–1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked	5.00
Jamesville, N. Y.—Analysis, 89% $CaCO_3$; 4% $MgCO_3$; 90% thru 100 mesh; in paper bags, 5.10; bulk	3.85
Lannon, Wis. — Analysis, 54% $CaCO_3$ 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook and Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh	.90
Olive Hill, Ky.—50% thru 4 mesh	1.00
Rocky Point, Va.—50% thru 200 mesh, bulk, in carloads, 2.00; 100-lb. paper bags, 3.25; 200-lb. burlap bags	3.50
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 100 mesh, bulk	3.50
100-lb. paper bags, 4.75; 100-lb., cloth	5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh	2.10

*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Hillsville, Penn., sacks, 5.10; bulk	3.50
Joliet, Ill.—Analysis, 50% $CaCO_3$; 44% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis. — 90% thru 100 mesh, bulk	4.00

Lime Products

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Berkeley, R. I.			11.40			17.50		20.65
Buffalo, N. Y.				12.00				
Knickerbocker, Devault, Cedar Hollow and Rambo, Penn.*		9.50	9.50	9.50		9.50	8.50	
Lime Ridge, Penn.			8.75		6.50	8.00[3]	5.00	
CENTRAL:								
Afton, Mich.						10.75	7.50	
Carey, Ohio	9.50	6.50	6.50		8.00		8.00	
Cold Springs, Ohio		7.75	7.75				7.50	
Gibsonburg, Ohio	10.50		7.75		7.00	9.00[9]	7.50	
Huntington, Ind.		6.50	6.50					
Little Rock, Ark.		14.40		14.40			11.90	
Marblehead, Ohio		6.50	6.50				7.00	
Milltown, Ind.		7.50– 8.50		8.25– 9.25	7.00[5]	9.25[6]	6.50[7]	
Scioto, Ohio	10.50	7.50	7.00	8.00			7.00	15.00
Sheboygan, Wis.		10.50	10.50	10.50			9.50	
Tiffin, Ohio					8.00	10.00		
Wisconsin points		11.50					9.50	
Woodville, Ohio	10.50	7.75	7.75	11.50[24]	7.00	9.00[9]	7.00	
SOUTHERN:								
Keystone, Ala.		9.00	9.00	10.00			7.00	
Knoxville, Tenn.	17.00	9.00	9.00	9.00	6.00	1.25[10]	6.00	
Ocala, Fla.		11 00						
Pine Hill, Ky.	17.00	9.00	9.00	9.00	6.00	1.25[10]	6.00	
WESTERN:								
Kirtland, N. M.							12.00	20.00
Los Angeles, Calif.							12.00	
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[20]		11.00[19]	
San Francisco, Calif.†	20.00	16.00	12.00	20.00	16.00		16.00	

[1]Also 6.00. [2]To 1.35. [3]In 100-lb. bags. [5]To 7.50. [6]To 9.75. [7]To 7.00. [9]In 80-lb. paper. [10]Per bbl. [17]Less credit for return of empties. [19]To 14.50. [20]Also 13.00. [21]Superfine, 92.25% thru 200 mesh. *Price to dealers. †Wood-burnt lime.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 100% thru 200 mesh, 94% thru 300 mesh, 7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.
Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.50 per ton in bulk, plus 10c per bag.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Buckingham oxford grey	13.88	17.22	24.99	29.44	34.44	45.55
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Gen. Bangor No. 2 ribbon	6.75– 7.25					
Gen. Bangor mediums	9.50–11.25					
Chapman Quarries, Penn.—No. 1	9.25–11.25					
Medium	7.75– 9.00	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Monson, Maine	19.80	24.00				
Pen Argyl, Penn.*						
Graduated slate (blue)		16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)		18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*Unfading grey, 14.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Crude talc, per ton	5.00
Ground talc (20-50 mesh), bags	6.50
Ground talc (150-200 mesh), bags	9.00
Pencils and steel crayons, gross	1.50– 2.00
Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh	7.50– 8.00
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of bags. Terms 1%, 10 days.	
Clifton, Va.:	
Crude talc, per ton	4.00
Ground talc (150-200 mesh), in bags	12.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Emeryville, N. Y.:	
Ground Talc (200 mesh), bags	13.75
Ground talc (325 mesh), bags	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va:.	
Crude (mine run)	3.50– 4.50
Ground talc (150-200 mesh), bags	6.25–14.00
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Los Angeles, Calif.:	
Ground talc (150-200 mesh), in bags	15.00–60.00
Crude talc, f.o.b. mine	8.00–12.00
Natural Bridge, N. Y.:	
Ground talc (325 mesh), bags	10.00–15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 65-72%	3.75– 4.25
Mt. Pleasant, Tenn.—B.P.L. 76-78%	6.75

Ground Rock

(2000 lb.)

Gordonsburg, Tenn.—B.P.L. 65–70%	3.75– 4.25
Mt. Pleasant, Tenn. — Lime phosphate: B.P.L. 73%	11.20–13.00
Mt. Pleasant, Tenn.—B.P.L., 72%	5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	100.00–125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, Bristol and Cardigan, N. H.—Per ton:	
Mine scrap	22.50
Mine run	300.00
Clean shop scrap	27.50
Roofing mica	42.00
Trimmed mica, per ton, 20 mesh, 40.00; 40 mesh, 42.00; 60 mesh, 45.00; 200 mesh	100.00

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	Plaster Board ¼x32x 36". Per M Sq. Ft.	Plaster Board ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa			6.00	7.00		7.50	8.50	10.50a					
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton, floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 3 in. long, 17c per ft., 23.00 per ton.													
Fort Dodge, Iowa	2.50	6.00	6.00	7.00	9.00	9.00	11.50	8.00	16.00	20.00	15.00		25.00
Grand Rapids, Mich.					9.00d	9.00d		8.00d		21.00d		15.00	25.00
Los Angeles, Calif. (b)		7.00–9.00	7.00–9.00	7.50–9.00	8.00–10.00		8.00–10.00		30.00c				
Medicine Lodge, Kan.	1.40						11.50d		16.00d	11.50d			
Portland, Colo.		7.00	7.00	9.00	9.00	9.50	9.00		27.50		22.50	27.50	
Providence, R. I. (x)				12.00–13.00e									
Seattle, Wash. (z)	6.00	9.00	9.00	13.00			14.00						
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00					20.00	25.00g	33.00f

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) White molding. (b) Plasterboard, ¼x32x36-in., 14c-17c per sq. ft.; ⅜x32x36-in., 15c-18c per sq. ft. (c) To 40.00. (d) Includes paper bags. (e) Includes jute sacks. (f) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (g) ⅜x48- by 3 to 4 ft. long. (x) "Fabricaste" gypsum blocks, 2- and 3-in., f.o.b. motor trucks at plant, 7¼c-8¼c. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft., 4-in., 11c per sq. ft.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.—Bio-Spar, per ton in bags in carload lots, 9.00; less than carload lots, 12.00 per ton in bags, bulk, per ton	....	7.50
Crown Point, N. Y.—Mica Spar	....	¶9.00–‖12.00
Davenport, Iowa — White limestone, in bags, per ton	¶6.00	¶6.00
Harrisonburg, Va.	12.50–14.50	....
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt.—Middlebury white	....	¶9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	c5.50
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–20,00
Tuckahoe, N. Y.—Tuckahoe white	6.00	....
Warren, N. H.	....	8.00–15.00
Whitestone, Ga.	....	10.00

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L.

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh, per ton	18.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140 mesh (bulk)	19.00
Keystone, S. D.—Color, white; analysis, K_2O, 13.25%; Na_2O, 1.92%; SiO_2, 63.50%; Fe_2O_3, .06%; Al_2O_3, 20.10%, pulverized 99% thru 200 mesh, in bags, 17.50; bulk	16.50
Crude, in bags, 9.50; bulk	8.50
Coatesville, Penn.—Color, white; analysis, K_2O, 12.30%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; crude, per ton	8.00
Erwin, Tenn.—White; analysis, K_2O, 10%; Na_2O, 2.75%; SiO_2, 68.25%; Fe_2O_3, .10%; Al_2O_3, 18.25%, pulverized 98% thru 200 mesh, in bags, 17.20; bulk	16.00
Crude, in bags, 8.50; bulk	7.50
Rumney and Cardigan, N. H. — Color, white; analysis, K_2O, 9-12%! Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk	7.00– 7.50
Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk	7.00– 7.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk	18.00

(Bags, 15c extra.)

Cement Drain Tile

Graettinger, Iowa. — Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in. 1.35; 36-in. 2.00

Grand Rapids, Mich.—Drain tile, per 1000 ft.	
4-in.	36.00
5-in.	48.00
6-in.	66.00
8-in.	100.00
10-in.	150.00
12-in.	210.00
Longview, Wash.—Drain tile, per 100 ft.	
3-in.	5.00
4-in.	6.00
6-in.	10.00
8-in.	15.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	12.00

Chicken Grits

Centerville, Iowa	9.25
Belfast, Me.—(Agstone), per ton, in carloads	10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	10.00
Coatesville, Penn.—(Feldspar), per ton, in bags of 100 lb. each	8.00
Cranberry Creek, N. Y.—Per ton, in carload lots, in bags, 9.00; bulk, 7.50. Less than carload lots, in bags	12.00
Davenport, Iowa — High calcium carbonate limestone, in bags L.C.L., per ton	6.00
El Paso, Texas—(Limestone) per 100-lb. sack	.75
Los Angeles, Calif.—Per ton, including sacks: Gypsum	7.50 –9.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00
Wisconsin Points—(Limestone), per ton	15.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton Wis.	10.50
Dayton, Ohio	12.50–13.50
Detroit, Mich. (d)	13.00–16.00*b
Farmington, Conn.	16.00
Grand Rapids, Mich.*	14.00–15.00
Jackson, Mich.	13.00
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00*
New Brighton, Minn.	8.00
Pontiac, Mich.	12.50
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	10.50–13.00b
Winnipeg, Canada	15.00

Delivered on job. (a) Less 50c disc. per M 10th of month. (b) 5% disc., 10 days. (c) Delivered in city. (d) Also 15.50. (f) Also 11.00, f.o.b. cars at plant. (g) F.o.b. yard.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Appleton, Minn.	18.00–20.00
Chicago, Ill., district: 8x8x16. Per 1000	180.00
Chicago, Ill.:	
8x 8x16. Each	.21†
8x 8x16. Each	.18b
8x10x16. Each	.26†
8x10x16. Each	.23b
8x12x16. Each	.30†
8x12x16. Each	.27b
Columbus, Ohio	14.00b–16.00†
Forest Park, Ill.	21.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Lexington, Ky.:	
8x8x16	a18.00*
8x8x12	a15.00*
8x8x16	b15.00*
8x8x12	b13.00*
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*

*Price per 100 at plant.
†Rock or panel face.
(a) Face. (b) Plain.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—12x8 exposure, 15x9-in. size, per sq.	9.50–12.00
Detroit, Mich.—5x8x12. per M	67.50
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Lexington, Ky.—8x15, per sq.:	
Red	15.00
Green	18.00

Cement Building Tile

Chicago District (Haydite):	
8x 4x16, per 1000	140.00
8x 8x16, per 1000	200.00
8x12x16, per 1000	300.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Lexington, Ky.:	
5x8x12, per 100	7.50
4x5x12, per 100	4.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000	57.50
4x8x12, per 1000	65.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Camden & Trenton, N. J.	17.00	....
Chicago District "Haydite"	14.00	....
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	13.00a	....
Forest Park, Ill.	....	17.00
Longview, Wash.	16.50	25.00
Milwaukee, Wis.	14.00	32.00
Omaha, Neb.	17.00	30.00– 40.00
Philadelphia, Penn.	15.50	....
Portland, Ore.	12.00	22.50– 55.00
Prairie du Chien, Wis.	14.00	22.50
Rapid City, S. D.	18.00	25.00– 40.00

(a) Delivered on job; 10.00 f.o.b. plant.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00

Note—Bags extra and returnable for full credit.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Grand Rapids Mich.(b)	......	......	......	.57	.67	.93	1.20	......	......	1.80	2.10	2.25	3.35	4.00	5.60	6.90	7.85
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Tacoma, Wash.	.15	.17	.22½	.30	.40	.55	.70	......	......	......	......	......	......	......	......	......	......

(a) 24-in. lengths. (b) Culvert; 21-in., 1.43. †21-in. diameter.

Cement Bid of $1.05 a Bbl. Rejected as Too High!

A LOW bid of $1.05 per barrel, f.o.b. mill, for cement to be used in the construction of the Hansen dam in Big Tujunga canyon, was rejected by the Los Angeles county board of supervisors on the basis that a still lower price is expected. The bid was offered on 102,000 bbl. The price bid is the lowest in years in the locality, cement contracts for the previous year ranging about $2 per bbl.—*Los Angeles* (Calif.), *Times*.

Recent Contract Prices

Peoria, Ill. Swords and McDougal, Peoria, awarded contract to excavate and haul 14,000 cu. yd. of gravel for completion of Allin township's road system, on a bid of 98 cents per cu. yd.

Milwaukee, Wis. Sharp reductions were noted in the cost of building materials recently when the city purchasing board opened bids for sand, gravel and crushed stone. The reductions compared with 1929 prices will be between 10% on some commodities and as high as 30% on others, J. W. Nicholson, city purchasing agent, said.

The contract last year was awarded to the Mineral Aggregate Producers' Co-operative Association, an organization which included virtually all of the producers in the county. It has since suspended and all producers this year submitted independent bids.

As an example of the lower prices, Mr. Nicholson cited gravel used in concrete mixes. Last year the aggregate association delivered gravel anywhere in the city at a cost of $2.75 per cu. yd. The low bid this year is $1.89 per cu. yd. anywhere on the north, east and west sides, and $2 per cu. yd. on the south side.

Reductions not quite as great were discovered in crushed stone used for concrete mixes. The 1929 prices per cu. yd. fixed by the aggregates association were as follows: North side, $2.37½; west side, $2.25; east side, $2.37½; and south side, $2.35.

The low bid entered by an independent producer follows:

North side, $2.04; west side, $1.75; east side, $2.25, and south side, $2.18.—*Milwaukee* (Wis.) *Journal*.

Wildwood, N. J. The Wildwood Crest Borough Council let contract recently for 2000 tons of road gravel to I. T. Woolson, Wildwood, for $1.25 per ton.

James H. Cooke

JAMES H. COOKE, president of the Hartford Sand and Stone Co., Hartford, Conn., and of the Lynn Sand and Stone Co., Swampscott, Mass., died March 21, at his new home in Swampscott.

Mr. Cooke was originally in the ice business at Plainville, Conn., and opened a trap rock quarry and crushing plant in that town in 1893. A few years later, he sold out that business to the White Oak Stone Co., and established a new quarry and crushing plant at Rocky Hill, Conn., in 1899. This plant was merged with the Connecticut Quarries Co. in 1902, and Mr. Cooke became general manager of that company, serving in that capacity until 1918, when he gave up that position to organize the Hartford Sand and Stone Co., at Hartford, Conn., and opened quarries and crushing plant at Farmington, Conn., with a sand plant at East Hartford, Conn. A few years later he formed another company, the Lynn Sand and Stone Co., at Swampscott, Mass., and started a quarry and crushing business there. He remained a director of the Connecticut Quarries Co. until that company retired from business in 1925 to be succeeded by the present Connecticut Quarries Co.

Mr. Cooke was 66 years of age and is survived by a widow, two daughters and a son, Theodore, who was connected with him at Swampscott quarries at the time of his death.

Consolidated Rock Products to Have General Building Supply Business

THE Consolidated Rock Products Co., Los Angeles, Calif., having formerly restricted its business to the production and sale of washed sand, rock and gravel, has expanded its operations to include the sale of cement plaster and mason's supplies and the establishment of warehouses for their storage.

Walter Moore, Jr., sales manager, states warehouses have been established for the new lines at convenient locations in Glendale, Compton, Whittier and Los Angeles. Additional warehouses are now under construction at Sherman and Long Beach.

At the next directors' meeting the executive committee will recommend to the board that Ford J. Twaits be elected president and general manager to fill the vacancy caused by resignation of George A. Rogers.

The Consolidated company, a consolidation of three of the leading aggregate producers in the Los Angeles district, operates 23 producing and 21 distributing plants.

North American Cement Adds to Catskill Holdings

AUGMENTING other and recent purchases of quarry lands in the district, North American Cement Corp. is reported to have bought 200 acres at Catskill, N. Y., for an undisclosed consideration.—*Catskill* (N. Y.) *Mail*.

Retail Prices of Various Rock Products Materials

THE TABLE below gives average prices paid February 1, 1930, by contractors for various rock products, delivered on the job at different principal cities of the United States. These prices were secured through the Bureau of Census.

AVERAGE RETAIL PRICES FOR ROCK PRODUCTS MATERIALS, FEBRUARY 1, 1930

City	MATERIAL: Portland cement, per bbl. excl. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.80	....	$20.00	$1.50	$2.25	....
New London, Conn.	3.00	$25.00	26.00	1.50	2.40	$18.00
New Bedford, Mass.	2.45	25.00	18.25	1.75	3.00	18.50
Haverhill, Mass.	2.80	27.50	20.00	2.00	......	18.75
Poughkeepsie, N. Y.	2.04	....	....	2.25	2.20	....
Albany, N. Y.	2.97	24.75	18.00	......	......	17.00
Rochester, N. Y.	2.70	22.00	21.00	2.50	2.40	16.00
Syracuse, N. Y.	3.00	22.50	26.00	2.00	2.00	17.00
Buffalo, N. Y.	3.10	25.00	18.00	2.50	2.05	14.00
Paterson, N. J.	2.60	26.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Scranton, Penn.	2.80	....	18.00	3.25	......	17.00
Philadelphia, Penn.	2.35	....	15.50	1.75	2.40	19.75
Baltimore, Md.	2.75	....	13.00	2.00	2.75	16.00
Washington, D. C.	2.65	25.00	14.00	......	......	17.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmount, W. Va.	2.90	35.00	17.00	3.25	3.50	18.00
Winston-Salem, N. C.	2.44	32.50	....	2.50	3.50	17.00
Atlanta, Ga.	2.85	....	15.00	3.04	3.00	16.50
Savannah, Ga.	2.25	25.00	20.00	2.00	5.50	16.00
Louisville, Ky.	2.40	....	15.50	2.20	2.43	16.00
Tampa, Fla.	2.40	....	24.00	2.00	4.25	22.50
Shreveport, La.	3.20	....	22.50	2.00	4.75	24.00
Erie, Penn.	2.60	25.00	17.00	2.25	......	16.00

City	MATERIAL: Portland cement, per bbl. excl. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
Akron, Ohio	$2.57	....	$18.00	$2.50	$3.00	$18.00
Columbus, Ohio	2.75	$23.00	17.50	2.25	2.50	15.00
Toledo, Ohio	......	22.50	20.00	3.04	2.75	16.00
Cincinnati, Ohio	2.72	25.00	16.40	2.62	2.55	....
Cleveland, Ohio	......	22.00	....	......	......	....
Youngstown, Ohio	2.95	....	20.00	3.71	2.75	....
Detroit, Mich.	2.60	21.00	14.80	2.75	3.00	....
Saginaw, Mich.	2.80	25.00	20.00	2.50	3.00	18.00
Terre Haute, Ind.	3.00	28.00	18.00	1.65	3.50	18.00
Chicago, Ill.	2.20	....	17.00	1.75	1.90	15.00
Milwaukee, Wis.	2.60	25.00	....	2.00	2.00	18.00
Lansing, Mich.	2.75	....	22.00	2.25	2.25	16.00
Des Moines, Iowa	2.66	23.75	20.00	1.60	3.60	....
St. Louis, Mo.	2.20	....	18.00	2.70	1.90	17.00
Kansas City, Mo.	2.40	25.00	23.00	2.00	1.87	15.00
St. Paul, Minn.	2.60	25.00	21.00	1.40	2.00	16.00
Sioux City, Iowa	2.80	27.00	26.00	1.50	2.25	16.00
Grand Forks, N. D.	2.80	25.00	....	2.60	......	16.00
San Antonio, Tex.	2.82	37.00	20.00	2.10	2.35	18.15
Tucson, Ariz.	3.07	....	30.00	1.25	2.25	16.50
Los Angeles, Calif.	1.72	34.00	24.00	1.35	1.50	17.50
Long Beach, Calif.	2.46	34.00	26.00	2.16	2.30	17.50
San Francisco, Calif.	2.60	....	22.50	1.40	1.60	20.00
Seattle, Wash.	2.40	35.00	22.00	1.40	......	20.00

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

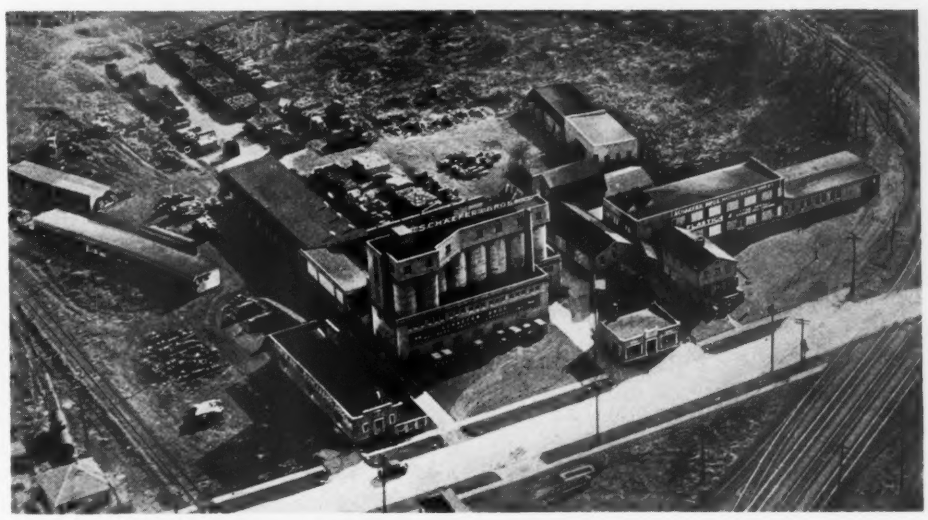
Merchandising Concrete Products—Then and Now

Part III—Describing the Business of Schaefer Brothers, Rochester, N. Y., in 1921 and Their Present-Day Plant

By T. A. Day
Oak Park, Ill.

FACTORS affecting the concrete products industry as discussed in 1921 by Albert F. Schaefer, Schaefer Brothers Cement Block Co., Rochester, N. Y., have important bearing on the business today. It can be said without the least exaggeration that present-day products manufacturers would be justified in following the four aims outlined by Mr. Schaefer in 1921.

Speaking in 1921, Mr. Schaefer said, "Business is good." He undoubtedly says the same thing today.

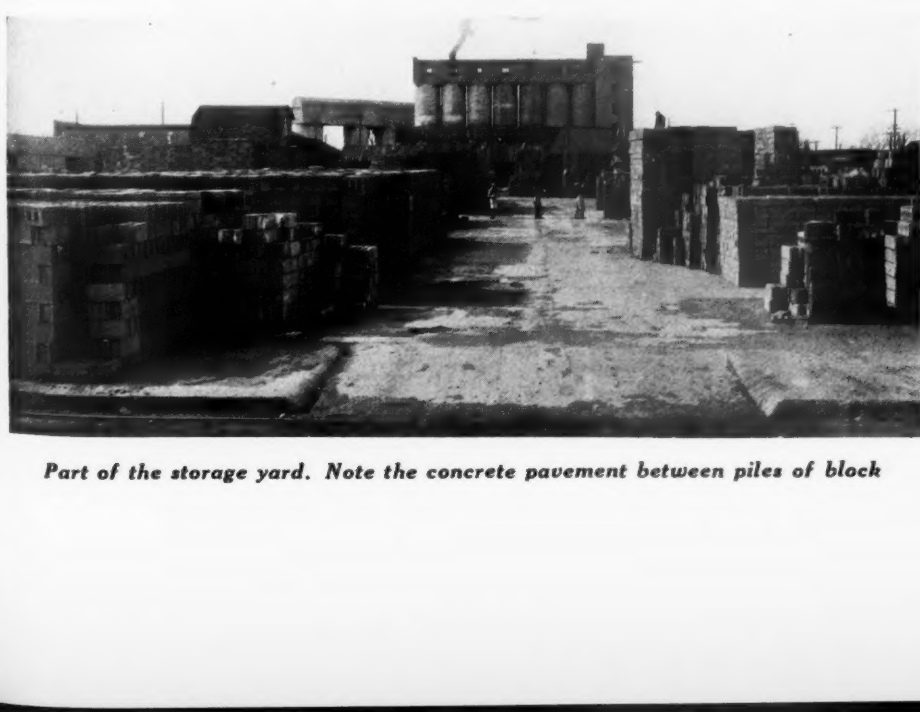


Airplane view of Schaefer Bros. Builders Supply Co., manufacturers and distributors of concrete products at Rochester, N. Y.

Guides to Development of Business

"We have doubled the capacity of our plant during the past year," continued Mr. Schaefer in 1921, "and will soon have to enlarge it again to keep up with the demand for our product. Four aims have guided us in the development of our business. First, to manufacture concrete building units of standard tested quality. Second, to keep production a step ahead of demand. Third, to use the most efficient equipment possible. Fourth, to advertise consistently and maintain a selling organization that will keep our production department going at full speed twelve months of the year.

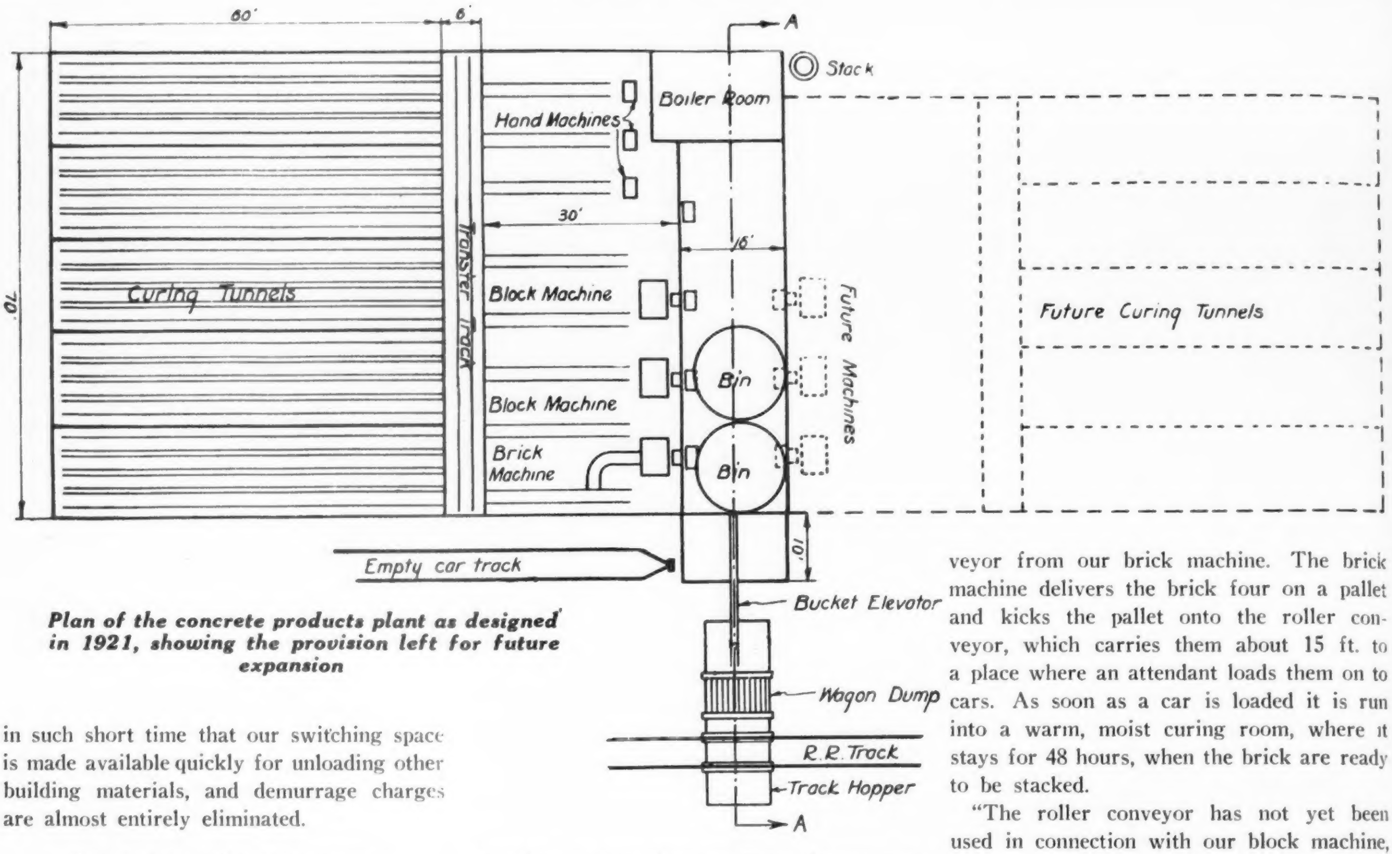
"We have not had a dull day in five years. Business is always good because our selling organization is on the job all the time and because we are able to manufacture block of reliable quality at a reasonable price, due to our efficient organization.



Part of the storage yard. Note the concrete pavement between piles of block

Efficiency in Operation

"We are trying to reduce labor to a minimum by the use of conveyors and automatic machinery. We find good equipment is cheaper than labor. As far as possible, all materials are handled by gravity. Our plant is designed to move all materials, both raw and finished, the shortest possible distance, and in straight lines. There is no back traveling from the time the cement and aggregates enter the plant until the finished product is stored in the yard. The bucket elevator which carries aggregates to the circular concrete overhead bins in which they are stored is of larger capacity than we need at present, but it will take care of future expansion. Furthermore, we can unload a car



Plan of the concrete products plant as designed in 1921, showing the provision left for future expansion

in such short time that our switching space is made available quickly for unloading other building materials, and demurrage charges are almost entirely eliminated.

Use Only Washed Aggregate

"We buy washed and screened aggregates, but as we must have aggregates of uniform grading, we run all of them through a rotary screen. From this screen the aggregates are carried by a belt conveyor to the proper bins. The fine and coarse aggregates are fed from the bottom of the bins into measuring cars which carry the dry batch to the mixers. The mixers are elevated above the machines so that they can dump the concrete directly into the hoppers back of each machine.

"Our block and brick machines are elevated about 20 in. above the floor so that workmen do not have to lift block in transferring them to curing cars. This makes it possible for the men to handle a greater number of units per day. It also gives enough fall to operate a roller gravity conveyor from our brick machine. The brick machine delivers the brick four on a pallet and kicks the pallet onto the roller conveyor, which carries them about 15 ft. to a place where an attendant loads them on to cars. As soon as a car is loaded it is run into a warm, moist curing room, where it stays for 48 hours, when the brick are ready to be stacked.

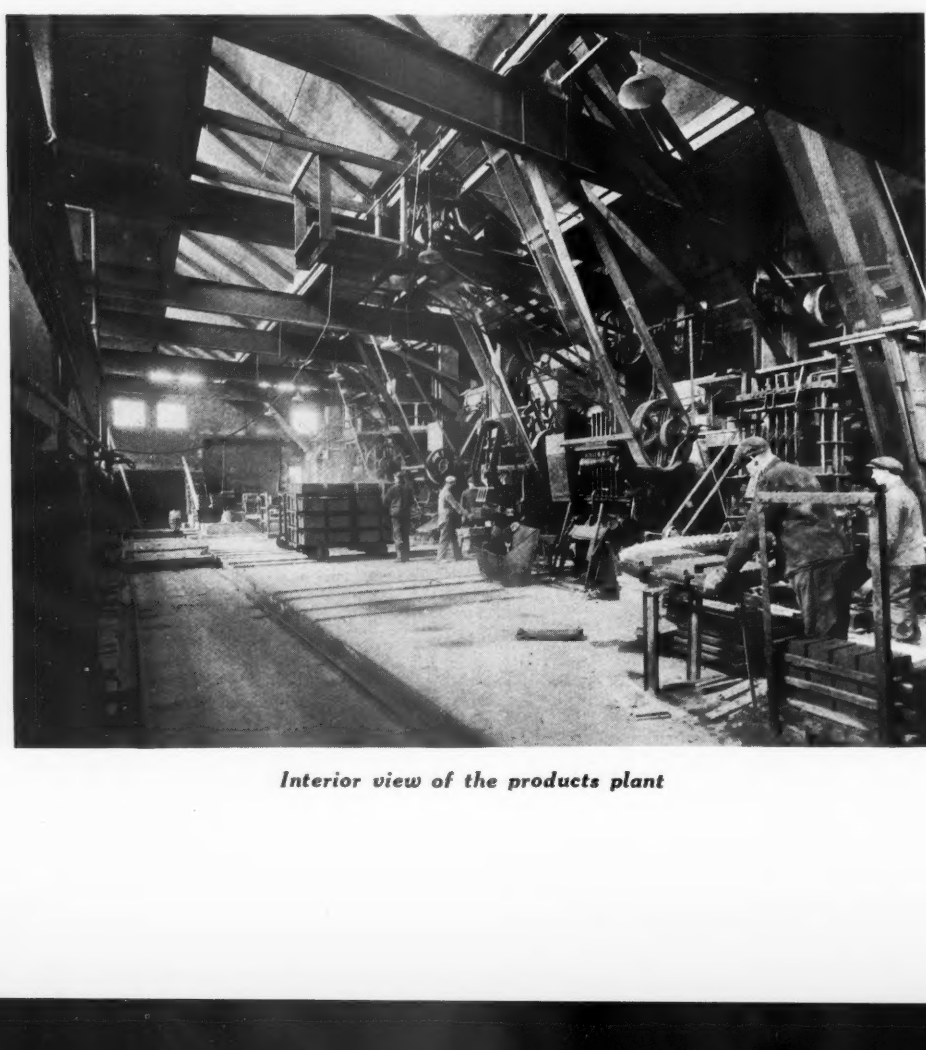
"The roller conveyor has not yet been used in connection with our block machine, but we feel that by using smaller rollers and by making a few other minor changes it can be used to advantage to take the block away from the machines fast enough to enable them to run to capacity. We have found from experience that off-bearing determines the speed of operation. Anything that will speed up off-bearing enables us to reduce the cost per unit.

"The curing of concrete products has as much to do with the quality as any other factor has. The walls of our curing tunnels are built of 8-in. concrete block. Each tunnel is four cars wide and can be filled in about three hours. The steam is immediately turned on and is run through water. The inside atmosphere is kept at about 110 deg. F. and is thoroughly saturated with moisture. Curing lasts 48 hours.

Easy Expansion Possible

"The plant is laid out," concludes Mr. Schaefer, "so that we can add to it at any time. No changes will have to be made in the factory units and equipment already installed. As new units are added, they will become part of the present system."

It is well that in 1921 the plant was so laid out that additions could be made easily and quickly, for Schaefer Bros. Builders Supply Co., Inc., as the firm is now called, now produces about 1,000,000 block and 2,000,000 concrete brick each year. In fact, the expansion has been so great that an office is maintained in the busines district of Rochester as a sales and display headquarters, nearly 50 employes make up the personnel of the factory and sales force, and a fleet of 11 trucks is maintained to give



Interior view of the products plant

Concrete storage silos for materials

Part of the delivery truck fleet, Schaefer Bros.

prompt and efficient service to customers.

Albert F. Schaefer, who realized the importance of the concrete products industry when he made the foregoing statements in 1921, is now vice-president of the company. And the founder of the business, Ferdinand Schaefer, is also quite active in the present-day affairs of the organization. While Oscar Schaefer is in charge of distributing the concrete block and brick, Walter Schaefer handles all shipping. The sales manager of the company, Raymond Corbit, has acted in that capacity for 15 years.

Messrs. Bertsch, introduced in Part 1; Krum, whom the readers met through reading Part 2, and the Schaefers, whose business is described in this concluding article, have become important leaders in the concrete products industry solely because they realized as long ago as 1921 that the business had unlimited possibilities. They directed every effort to advertising, personal selling and, last but not least, to the manufacture of quality products that would lend the proper prestige to concrete masonry. They were never "behind the times;" in fact, they were just a few years ahead of the industry, just as the progressive manufacturers are today.

Ornamental Cast Stone to Be Made in Sioux City

ORNAMENTAL STONE CO. is moving its plant from Minneapolis, Minn., to Sioux City, Iowa, according to the *Sioux City* (Iowa) *Journal*. The company manufactures "Stonite" products, cast stone novelties and plaques, in a variety of colors and shapes. George B. Lee is president.

New Ready-Mixed Concrete Plant in New York State

A NEW quarter of a million dollar corporation, the Westchester Certified Mixed Concrete Co., Inc., will begin operations on April 1 according to an announcement in the *Port Chester* (N. Y.) *Item*.

The plant, to be located in Rye, N. Y., near the harbor, will cost about $100,000, and equipment, including a Parke-Gillespie carrier for mixing concrete while en route to the job, will cost approximately $50,000. Several trucks will be operated at the start, and a fleet provided with the development of business.

Officers of the company are Fred Lux, president; John Macri, vice-president, and Edward J. Cooney, secretary-treasurer.

Straub Cinder Concrete Block Patents Again Upheld

THE Federal District Court, Baltimore, Md., on March 13, handed down a decision in favor of the National Building Units Corp., Philadelphia, Penn., owners of the Straub cinder concrete block patents; this is the first decision affecting Straub patent No. 1,212,840.

Another important feature of this decision is that it involves the Cordery patent No. 1,218,239. The defendant held a license under the Cordery patent and defended on the ground that its operations under the Cordery process did not infringe the Straub patent. A further defense was that the cinders were separated into coarse and fine and then recombined in the mixer; it being claimed that this was not a violation of the teachings of Straub.

The suit was vigorously defended by counsel for the defendant, Maryland Concrete Corp., and by the general counsel for the Cordery Co. They called to the witness stand experts from the Massachusetts Institute of Technology and Susquehanna University. Their testimony was met by evidence of Einar Christensen, chief engineer of the National Building Units Corp., Dr. E. L. Conwell and his chief chemist, J. F. Heitzman, of Philadelphia, and by tests and experiments made at Johns Hopkins University under the direction of Prof. J. T. Thompson. The trial and argument of the case occupied four days.

The Straub patent relates to a building block and a method of making the same. The object of the patent, the method pursued and the qualities of the resulting product are described in the following quotation from the patent specification:

My invention has in view to provide a building block, brick, or slab composed of a mixture of lump and fine cinder, cement and water, without the use of sand or any other material, and consists in the process of manufacturing the same and the resulting product.

Ordinarily, concrete mixtures of various kinds utilize sand, crushed stone, or other mineral as a body or filler, either wholly or partly in combination with the required proportion of cement as a binder. In carrying out my invention I use coal cinders or ashes which are first crushed or ground to a consistency composed of pieces not larger than say three-quarters inch and retaining all of the smaller sizes and the dust and fine ashes, which are otherwise ordinarily thrown away as refuse. This crushed material, after reducing the larger lumps and clinkers, which are more or less porous, provides the coarser pieces or lumps of a maximum size sufficiently small to enable the cement to penetrate through their pores and interstices and bind the entire mass in a homogeneous body. The ground mixture also retains all of the usual accompanying adhering portions of the cinders in the resulting product and it is essential that the original mass of cinders and ashes as it comes from the furnace grate bars, or other source remains in the resulting mixture without separation or change of proportions.

A suitable proportion of cement, say one-sixth, is added with the necessary water, and the batch is then very thoroughly mixed. The retained finer cinder and ashes, combined with the cement, thoroughly mixed with the larger pieces, providing a uniform quality of all sizes throughout, and measured portions of the resulting mass are molded into block, brick or slab-form and then dried.

Owing to the absence of sand or other similar mineral material, the resulting blocks, etc., harden by natural evaporation and at the same time, retain the porous light qualities of the original cinders to a very considerable degree, while at the same time having the necessary strength and resistance to crushing strains.

The decree adjudged the patent valid and infringed.

Vaulted Concrete Sidewalks

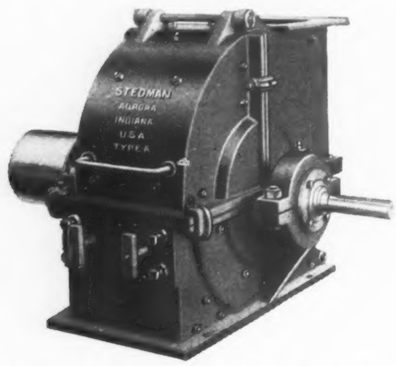
THE Portland Cement Association, Chicago, has brought out a pamphlet with the above title in which is discussed definite requirements for vaulted sidewalks and how these requirements may be attained. Suitable specifications are included for making satisfactory sidewalks with economy in first cost and in minimum service expenditures.

New Machinery and Equipment

New Hammer Mills for Various Purposes

A COMPLETE line of swing and ring type hammer mill crushers and pulverizers, in three types and 25 sizes, is announced by the Stedman's Foundry and Machine Works, Aurora, Ind. The smallest size requires 5-hp. and the largest, 250-hp., to operate. Types A and B have features especially suitable for the reduction of stone, lime and gypsum, the manufacturers state.

Type A, a general purpose machine, built

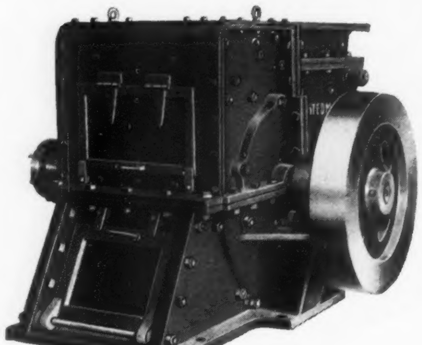


Hammermill crusher for reducing material to 10-mesh and under

in seven sizes, reduces material by the two-stage method and can be used where it is desired to grind material such as limestone down to 10- to 40-mesh or finer. Large capacities, low maintenance and a uniform finished product are claimed by the manufacturer for this crusher. Other features include a built-in metal trap, heavy renewable wearing plates, adjustable grinding plates, self-aligning ball bearings, accessibility and heavy construction.

The Type B machines, made in 12 sizes, are offered for heavy duty purpose, such as crushing limestone and gypsum; the larger size of this type will reduce 24-in. cubes of material to ¾-in. and under in one reduction, it is stated. The manufacturer claims these machines are among the heaviest offered for this class of work.

Features of the "B" type are similar to the "A" except that construction is heavier because of more severe service demanded for these machines.



Heavy duty crusher for limestone, gypsum and other materials

New 1½-Ton Motor Truck

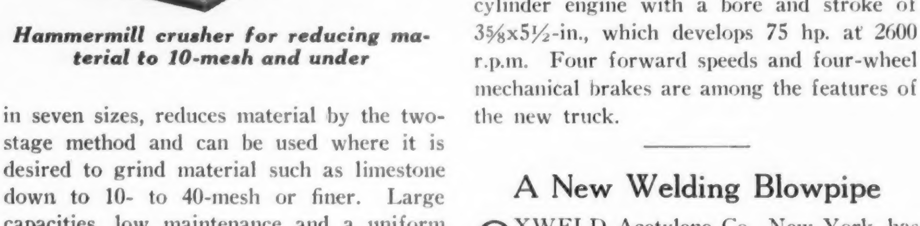
MACK Trucks, Inc., New York City, has recently brought out Model BG, a six-cylinder 1½-ton truck for fast delivery service. Adapted to a wide variety of bodies, this chassis is available in three standard wheelbase lengths of 138-, 158- and 168-in.

The new unit is powered by a Mack six-cylinder engine with a bore and stroke of 3⅝x5½-in., which develops 75 hp. at 2600 r.p.m. Four forward speeds and four-wheel mechanical brakes are among the features of the new truck.

A New Welding Blowpipe

OXWELD Acetylene Co., New York, has recently announced another new blowpipe. The Type W-17, as it is called, employs the same low pressure injector principles used in other Oxweld blowpipes. The tip and welding head are of one piece construction, being combined in a long and slender stem of the goose-neck type. The injector is located at the base or handle end of the stem. Each welding head has its own nut for attaching it to the handle of the blowpipe. The handle of this new blowpipe is made of a special brass tubing having longitudinal ribs. The valve wheels are of a new design and are located so as to be readily accessible yet out of the way during the welding operations.

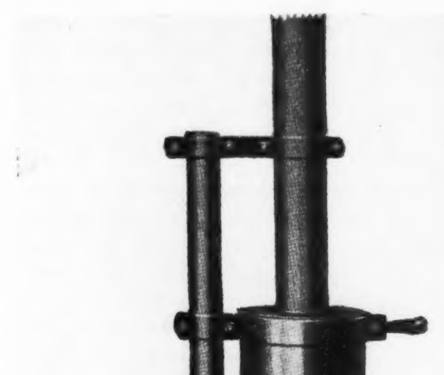
The new blowpipe is compact and light and with the No. 4 welding head it weighs about 2 lb. The long thin shape of the welding heads makes it possible for this blowpipe to be used in places inaccessible, it is said.



Welding blowpipe to reach inaccessible places

Close Temperature Regulation a Feature of New Gas-Fired Laboratory Furnace

A NEW gas-fired laboratory furnace, possessing several novel features and useful operating characteristics, has been placed on the market by the Babcock and Wilcox Co. The furnace is fitted with an atmospheric burner which requires no auxiliary equipment, and can be left to burn unattended with safety. It will maintain a uniform temperature over long periods, and if fitted with the usual gas pressure regulator will maintain a temperature of plus or minus 10 deg. F. for several days, it is said.



New gas-fired laboratory furnace

It is claimed that this furnace can be brought up to working temperature very quickly, recent tests showing the furnace to be capable of being brought from room temperature to 2500 deg. F. in about 30 min., and to 2000 deg. F. in approximately 15 min. The maximum temperature is somewhat over 2600 deg. F., using ordinary manufactured

illuminating gas under the usual 3-in. (water gage) pressure.

The maker states that these unusual time-temperature operating characteristics are due to the use of proper gas velocities in the furnace, the stack proportions, a unique baffling arrangement, and the use of a new refractory insulator lining which is said to have an extremely low heat conductivity.

Either natural or manufactured gas may be used with the furnace, though the temperatures will be slightly lower with the former. The furnace is compact, a feature which, combined with the insulating effect of the refractory lining, makes it relatively cool and very convenient to work around.

A device of this kind has many uses in the laboratory, many of which are apparent, but the maker calls special attention to the utility of the furnace for sintering or melting samples of cement raw mixes, glass, glazes, enamels, as well as burning small bodies of other rock products materials.

Standardized Drives for Screw Conveyors

STANDARDIZED drives for screw conveyors 8 to 16 in. in dia. are announced by H. W. Caldwell and Co., Chicago, in two new arrangements known as type "C" and type "D." The type "C" drive consists of two speed reductions from motor to screw conveyor, each through a Link-Belt silent chain drive fully enclosed in an oil-retaining steel casing, and a worm gear speed reducer, designed to serve as a thrust end and screw conveyor drive. Type "D" drive consists of a direct coupled reducer, mounted with motor on unit base plate. This type of drive permits the selection of a worm gear reducer according to horsepower rating, without regard to the size of the conveyor trough on which the drive is to be mounted.

All of the reducer bearings on both types are anti-friction, with automatic lubrication. Oversize Timken bearings on worm gear shaft take the conveyor end thrust in either direction. The drive is adaptable to horizontal or inclined conveyors, with proper adjustment of the oil levels.

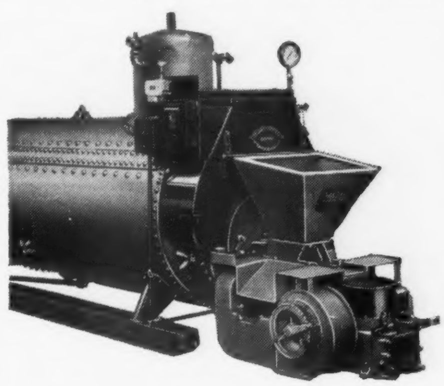
Standard motors of 860, 1160, 710 or 1430 r.p.m. can be accommodated on these conveyor drives. Standard drives provide a range of conveyor speeds from 45 to 125 r.p.m.

Left—Standardized screw conveyor drive comprising two speed reductions from motor to screw, each through a silent chain

Right — Another standardized drive consisting of a direct-coupled reducer mounted with motor on unit base plate

Automatic Stoker for Marine Type Boilers

A NEW automatic underfeed stoker for Scotch marine type internally fired return tubular portable boilers has been announced by James Leffel and Co., Springfield, Ohio. This machine, which is shown in the accompanying illustrations, attached



Automatic underfeed stoker firing a marine type boiler

to a Leffel Scotch marine type boiler, is made in sizes from 15 hp. to 200 hp. and can be quickly attached to boilers of this type which are already in use.

With the automatic stoker in operation there is no necessity for opening the fire box door. The machine is electrically operated (unless steam turbine drive is preferred and ordered) and the rate of firing, as well as the amount of air admitted to the fire box, is automatically controlled by the steam pressure of the boiler. Lowered steam pressure automatically increases the firing speed and force draft, so that the boiler will operate to its full efficiency at all times without attention, the manufacturers state.

The machine is sturdily and simply constructed, requiring but little attention, it is said. The gearing is totally enclosed and dust proof, operating in an oil bath. The stoker itself takes up no more room than would be required for a man in the act of shoveling coal into the fire box. Under average conditions, it is necessary to fill the hopper at intervals of approximately two hours.

New Self-Lubricating Bearing

A NEW self-lubricating bronze bearing has just been announced by the Johnson Bronze Co., New Castle, Penn. The new bearing is said to provide for a uniform area of bearing surface on the pressure line and to insure an efficient distribution of lubricating compound.

The improved results are obtained by a new method of effecting indentations in the metal and by placing them on an angle of 30 deg. Patent covering this method has been applied for. According to the manufacturer, it is only by cutting these indentations that an effective receptacle can be formed for the lubricating compound.

New Motor Trucks

THREE new delivery trucks, models B, C and D, 1½, 2 and 2½-ton, respectively, are announced by Gramm Motors, Inc., Delta, Ohio. Each design is powered with a six cylinder gasoline engine, rated at 85 hp. for the C and D models and at 60 hp. for the B, rubber mounted at all three points of suspension. Other features include four-wheel hydraulic brakes, four-speed transmission, full floating bevel gear rear axle, etc.

The truck frames are claimed to have a low frame height and are supported on long chrome vanadium steel two-stage springs.

Easton Quarry Cars to Be Made in France

W. E FARRELL, president of the Easton Car and Construction Co., Easton, Penn., announces that he has completed arrangements with E. Constantin, 105 Rue Lafayette, Paris, France, to manufacture the Easton line of quarry and industrial cars in France.

News of All the Industry

Incorporations

Contractors, Inc., Detroit, Mich., $50,000. To engage in quarrying.

East Tennessee Mineral Co., Inc., Kingsport, Tenn. E. C. Graves and E. B. Harris.

Pilgrim Sand and Gravel Corp., Farmingdale, N. Y., $20,000. W. B. Carman, Farmingdale.

Brooklyn Sand and Gravel Corp., Brooklyn, N. Y., 100 shares common.

Superior Material Supply Co., Trenton, N. J., $125,000.

Indiana Limestone Co. of Canada, Ltd., Toronto, $25,000.

Cincinnati Builders Supply Co., 209 East Sixth St., Cincinnati, Ohio, $8215. Paul Brookbank and Theodore Riverman.

Hamilton Stone and Flagging Co., Hamilton, Wis., $15,000. Edwin A. Nast, L. A. Voell and Katherine M. Nast.

Southworth Material Co., Madison, Wis., 500 shares, no par value. To deal in stone and other building materials. P. D. Southworth, W. Southworth and A. Towey.

Lake County Sand and Gravel Co., Willoughby, Ohio, 250 shares, no par value. C. A. Bauer, Jerry Palmer, Robert O. Burton and A. C. Knight, Township Hall, Willoughby.

Cincrete Pipe and Sand Co., Wheeling, W. Va., $50,000. To deal in sand and gravel and to manufacture cement products. Carl O. Schmidt, Albert W. Laas, J. H. Burning, Hazel Wallace and Kathryn Archer, all of Wheeling.

The Rensselaer Sand and Gravel Co., Inc., Rensselaer, N. Y., $50,000, consisting of 500 shares at $100 each. William P. McEniry and Eva La-Cholter, Albany, N. Y., and Jane H. Zoellner, Rensselaer, N. Y.

The Ready-To-Use Concrete Co., 211 West Front St., Plainfield, N. J., $250,000. Martin A. McDonough and Arthur D. Stout, both of Plainfield; William H. Weldon and George H. Riley, Jr., both of Westfield, N. J., and Irving W. Wortman of Morristown, N. J.

Quarries

Kaukauna Quarry Co., Kaukauna, Wis., has installed a gasoline shovel at its quarry.

Inland Lime and Stone Co., Manistique, Mich., has presented more than 65 acres of land to the city of Manistique for industrial sites.

Monarch, Colo. The Burton limestone quarry here is operating at full time. A new large steam shovel for loading the cars at the quarry has just been installed. Warren E. Burton is manager.

Georgia-Quincy Granite Co., operating a quarry at Granite Hill, Ga., has announced that its plant has been reopened and new equipment installed. C. T. Bailey is general manager.

Redgranite, Wis.—Construction work on new 500-ft. spur track started at West Point quarry; this will permit direct loading of breakwater stone to gondola cars.

New Castle Lime and Stone Co., New Castle, Penn., is considering erection of one-story stone-crushing and distributing plant at New Castle Junction, to cost $40,000 with equipment.

Lambertville, N. J. The quarry known as the "Company Quarry" above Prallsville, N. J., which has been idle for a number of years, is now being operated by Long Branch interests, and Joseph Ledger has been made superintendent of the plant.

T. B. Gatch and Sons, Inc., 5937 Belair road, Baltimore, Md., are installing machinery and making other preparations for the development of a limestone mine at Calvary Road and James Run, Churchville, Md.

Shelby Rock Quarry, Shelby, N. C., has been leased by the Thompson Stone Co., and the plant which has not been in operation for several months due to the illness and subsequent death of Fred Wagner, is now in operation.

Bellefonte Lime Co.'s quarry at Salona, Penn., after a temporary shutdown, started crushing operations on March 1. During the winter months a number of repairs were made, and new machinery installed. A larger crusher was installed and new smokestacks put in place with the new crusher.

Radford Limestone Corp., Roanoke, Va., with quarries in Pulaski county at the junction of Little river and New River, near Radford, has been acquired by the Appalachian Electric Power Co., Bluefield, W. Va. The new owners will quarry the stone for a large power project.

Raymond Harris, Murphy, N. C., has obtained an option on a marble deposit at Marble, N. C. Overburden has been stripped from 250 sq. ft., and shows the deposit to be high grade silver grey and blue grey marble. Core drilling showed the deposit to be from 250 to 300 ft. in depth.

Marsh and Cunha have leased the Torpy quarry at Half Moon Bay, Calif., and are installing approximately $10,000 worth of quarry equipment. Five trucks, equipped for hauling rock and sand, have already been installed, and others will be added as the business is developed.

Laura Gravel and Stone Co.'s quarries near Phillipsburg, Ohio, has resumed operations and is making preparations to supply increased demands this year for crushed stone, gravel and agricultural limestone. I. E. Baker is general manager; Edward Mattis, president, and Walter J. Steiner, vice-president.

Lakeport Supply Co., Detroit, Mich., has supplied the crushed stone and sand for the new John H. Schaefer building at Dearborn, Mich. The Lakeport company maintains a fleet of self-unloading boats which transport stone from its quarries to harbors on the Great Lakes. The company has two Detroit yards, and plants at Cleveland, Ohio, and Milwaukee, Wis.

Indiana Limestone Co., Bedford, Ind., has been awarded contract for 667 carloads of stone for the third unit of the West Virginia state capitol at Charleston. The company is also shipping a trainload of limestone for the walls of the United States territorial building at Juneau, Alaska, and will supply 200 carloads of limestone for the new 48-story Waldorf-Astoria hotel in New York City.

Bloom's Run Quarry, Gurwensville, Penn., has been acquired by Charles T. Eastburn and associates and will be put in shape to run at full capacity as soon as possible. Improvements will be made in the plant and new equipment installed at an outlay of approximately $50,000. It is reported that the quarry has a contract to supply the Dravo Contracting Co. of Pittsburgh with large quantities of material.

Atlantic Lime Rock Co., Sandersville, Ga., is installing new equipment, including a steam shovel, dragline and several dump cars. A large crusher will also be installed to reduce the lime rock to proper sizes for road building. Power for the crusher will be furnished by the Georgia Power Co. from its substation at Tennille. This company has built a line to the plant and connections will be made as soon as the building housing the crusher has been built.

Cement

Alpha Portland Cement Co., Easton, Penn., is installing Northern Blower dust collectors at its Martins Creek, Penn., plant.

Great Lakes Portland Cement Co.'s Cleveland packing plant is installing Norblo dust collecting equipment.

Wabash Portland Cement Co., Osborn, Ohio, has awarded contract to the Northern Blower Co., Cleveland, Ohio, for the installation of dust-collectors at its plant.

Huntington, W. Va. A school for builders, sponsored by the Huntington chapter of the American Association of Engineers and the Portland Cement Association to review the newer methods of controlling concrete quality, will be conducted at the city auditorium here. J. W. Kelley of the research laboratory of the cement association will conduct the meetings. Topics to be discussed include the handling of materials, proportioning, batching, mixing, transporting, placing, curing and special methods.

Sand and Gravel

F. J. Kernan, Reedsport, Ore., has let contract for two gravel barges to carry 450 cu. yd. each.

Macksville Gravel Co., Terre Haute, Ind., has filed papers evidencing preliminary dissolution.

Clinton, Wis. The Finster gravel pit north of Clinton has been opened and material from the pit is being used for highway construction work.

Grants Pass, Ore. The county's new gravel crushing plant is now in operation here. The plant has a capacity of 300 cu. yd. of crushed gravel daily.

Yuma Sand and Gravel Co., Yuma, Ariz., is pushing completion of its new plant, preparatory to installing equipment recently purchased. The Yuma company was recently organized by E. L. Simpkins of the Hayward Lumber Co., Yuma, C. H. Trigg and H. L. Gardner.

Salem, Ore. The Spaulding interests in the Salem Sand and Gravel Co. have been purchased by Paul Wallace and Fred Anunsen, manager of the company for nearly 20 years. These two with J. Albert and L. Griffith now are proprietors of the company.

Walter E. Gaudin is making extensive improvements in his gravel pit near Vevay, Ind. Chutes for the different grades of gravel, an elevator and screens have been installed, to facilitate the handling of the contract for 4000 cu. yd. of gravel for county highways which was awarded Mr. Gaudin in January.

Lime

International Lime Co., Seattle, Wash., has been dissolved.

Southland Lime Co., Burns, Tenn., which was sold at auction last fall, has been reinstated by its buyer and former owner, A. D. Clark as the Jesse Allen Lime Co., and is back in operation.

Lively Lime Co., Gold Hill, Ore., is reopening and equipping the Miller Gulch limestone deposits three miles below Gold Hill on the opposite side of the Rogue river. The company in the past has obtained its supply of limestone from deposits on Kane creek owned by the Salem paper mills, and it is understood that upon completion of equipping of the quarries and lime kiln on the new site the old site will be abandoned.

Cement Products

Builders Supply Co., 522 South 22nd street, Fort Dodge, Iowa, has been organized by C. J. Kramme and J. L. Parsons, to produce concrete block, pipe and other building materials.

Orrville Cast Stone Co., Orrville, Ohio, has leased space on East Market street, Orrville, which will be converted into a display room for the company's concrete products. Earl Crummel heads the company.

Faulkner Concrete Pipe Co., Hattiesburg, Miss. has been awarded sub-contract by E. L. Gedney and Sons of Fort Wayne, Ind., general contractors, for $65,000 worth of concrete sewer pipe, comprising a large part of 55 miles of drainage lines to be laid in the city's new $360,000 sewer system. The pipe ranges in size from 8 to 36 in. in diameter.

Independent Concrete Pipe Co., Indianapolis, Ind., manufacturer of reinforced concrete pipe, is planning extensions and improvements in former plant of Indianapolis Concrete Products Co., 2050 South Harding street, recently acquired, including one-story addition and installation of pipe-making machine, mechanical-handling and other equipment, to cost about $50,000.

Miscellaneous Rock Products

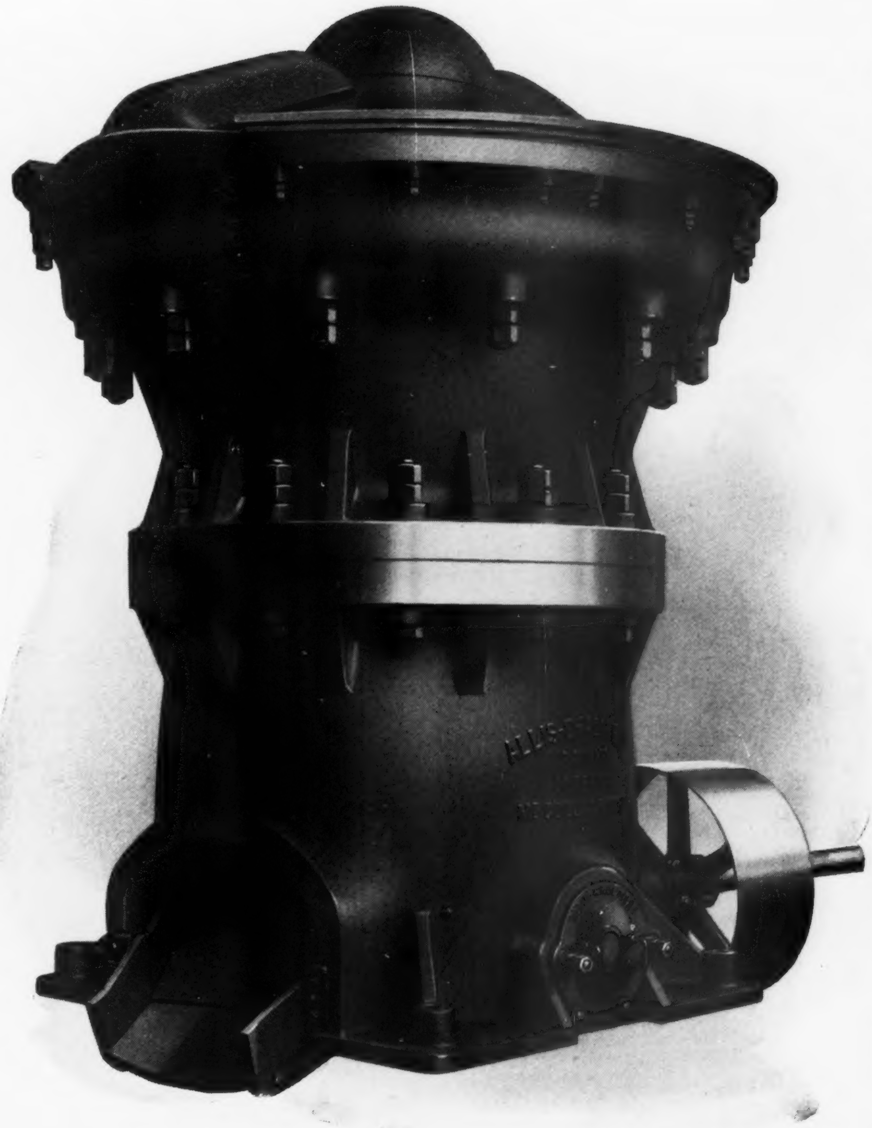
Donora, Penn. J. E. Cashion has plans completed for the erection of a large crushing and screening plant here on the Monongahela river. The building and equipment will cost approximately $100,000, and will be used for crushing slag and other materials used in the construction of highways.

Southern Mineral Products Corp., operated by Vanadium Corp. of America, Inc., New York, has engaged Stone and Webster Engineering Corp., Boston, to prepare plans for new mining and milling plant in Amherst and Nelson counties, Virginia, with by-products unit for production of chemical products. Entire project will represent investment of more than $1,000,000. Work will begin early in spring.

Personals

J. N. Fenstad, northwest representative of the United States Gypsum Co., Chicago, Ill., has established headquarters in Tacoma, Wash.

Harry L. Rownd, vice-president and director of Republic Steel and Iron Co., has resigned, announcing his retirement from the steel business.



George B. Harris was elected to the board of directors of the American Brick Co., Boston, Mass., at the recent stockholders meeting of that company.

James Nugent, general manager of the Bedford-Nugent Sand and Gravel Co., Evansville, Ind., and Mrs. Nugent have been making a motor tour of several western states, stopping at Palm Springs, Ariz., for a while and also at San Diego, Calif.

R. H. McGredy has become connected with the Harnischfeger Sales Corp. of Milwaukee, Wis. He will be employed in an executive sales capacity with headquarters at 50 Church St., New York City.

E. Grant Lantz, assistant manager of the cement products bureau of the Portland Cement Association, visited San Antonio last week conducting several meetings to assist members of the building industry to improve design and methods of construction where cement is used.

Otis F. Calvin, president of the Indianapolis Sand and Gravel Co., Indianapolis, Ind., who suffered a nervous breakdown several months ago, is still missing, according to reports. He left home on December 13 telling his wife that he was going to a drug store, and has not been heard of since. He is believed to be a victim of amnesia.

W. E. Barker, engineering expert and specialist in concrete, who is connected with the Portland Cement Association, recently delivered two lectures on "The Design and Construction of Concrete Pavements" at Norfolk, Va. Such phases of the subject as aggregate storage, suitable materials, mixing and high early strength concrete were covered by Mr. Barker.

Herbert L. Garrard, formerly connected with the agricultural experiment station of Purdue, has been named assistant to Dr. G. N. Hoffer, director of the educational bureau of the N. V. Potash Export Co. in the middle west. Mr. Garrard will be in charge of the Chicago offices. He will succeed Walter P. Pollock, who has been transferred to the New York offices.

Hugh A. Wilson has been appointed to the position of technical service director of the Union Explosives Co., Inc., Pottsville, Penn. **Charles Heffner** has been appointed sales agent of the same company. He will be connected with the Pottsville office, and will cover Schuylkill, Columbia, Northumberland and Montour counties and part of Luzerne county, Pennsylvania.

Louis J. Kanitz has been appointed general sales manager of the Continental Motors Corp., Detroit, Mich. Mr. Kanitz joined the Continental organization in February, 1920, after resigning his commission as lieutenant commander in the United States navy. For the past three years he has been in charge of the industrial engine division of the company.

L. J. Kanitz

A. E. Schneider, for a number of years connected with the Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., and well known in the hammer mill field, is now in charge of designing and sales, Stedman's Foundry and Machine Works, Aurora, Ind. This company has recently announced a complete line of hammer mills for use in the rock products industry.

T. H. Merriam represented the Portland Cement Association at a meeting of concrete builders and local contractors held recently at Erie, Penn. Mr. Merriam reviewed the business experiences of over a thousand of the country's leading concrete contractors from facts secured by a nation-wide survey just completed in the concrete field. His talk was well illustrated with film slides.

Robert P. Martin has been appointed manager of the Carolina Portland Cement Co.'s Jacksonville branch. Mr. Martin is a veteran in the building and construction field, and for the past 11 years has been connected with the Mahoney Lumber Co. **W. A. Kline**, previously connected with the Atlanta, Ga., office of the company, has been made assistant branch manager of the Jacksonville branch.

Obituaries

Harry M. Haldeman, Hollywood, Calif., a director of the Valley Portland Cement Co. and president of the Pacific Pipe and Supply Co., died recently of a heart attack. He was 60 years old.

Peter Junkersfeld, vice-president of Stone and Webster Engineering Corp., died suddenly on March 18 at his home in Scarsdale, N. Y. He was known in the portland cement industry as a waste-heat power plant expert.

Frank E. Culver, 68, well-known in the gypsum products industry, died March 12 at Toledo, Ohio. He was instrumental in founding the American Gypsum Co. 30 years ago, and was also interested in the founding of the National Retarder Co. After disposing of his interests in Port Clinton he spent a few years in England, where he established a gypsum products plant. He disposed of this prior to the war and returned to Port Clinton to live.

Manufacturers

Bucyrus-Erie Co., South Milwaukee, Wis., at its annual meeting held recently, re-elected all directors.

Link-Belt Co., Chicago, Ill., announces the appointment of the Idaho Equipment Co., 118 Main St., Boise, Idaho, to handle its complete line of cranes, shovels and draglines.

Leeds and Northrup Co., Philadelphia, Penn., announces the new address of its Cleveland office, now in larger quarters at 1941 Union Trust Bldg., Cleveland.

Electric Machinery Mfg. Co., Minneapolis, Minn., announces the new location of its Baltimore office. Formerly at 432 North Calvert St., the Baltimore office will now be located at 600 North Calvert St.

Atlas Imperial Diesel Engine Co., San Francisco, Calif., has filed amended articles of incorporation at Wilmington, Del., increasing authorized capitalization to 350,000 shares from 300,000.

General Electric Co. has started foundation at Schenectady, N. Y., for a $75,000 addition to accommodate the vacuum tube department to be moved here from the Cleveland plant.

Gears and Forgings, Inc., Cleveland, Ohio, announces the removal of its Ganschow division to its new location at 2108-2120 North Natchez Ave., Chicago. The Chicago district sales offices, in charge of C. F. Goedke, district sales manager, will be located at the new plant.

E. I. du Pont de Nemours and Co., Wilmington, Del., announce that Irenee du Pont has retired as chairman of the finance committee and has been succeeded by Walter S. Carpenter, Jr., vice-president in charge of finances. Other officers were re-elected.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has been awarded contract for the manufacture of the initial electric generating unit for the new power plant to be built at Port Washington, Wis., by the Milwaukee Electric Railway and Light Co.

Harbison-Walker Refractories Co., Pittsburgh, Penn., through E. B. Guenther of the Bureau of Research of Pittsburgh, recently presented "The Romance of Silica Brick" to its employes and friends at Mount Union, Penn. The lecture was made very impressive by the use of slide pictures showing the methods of brick manufacture. Imperfections to be guarded against and the use of silica brick in industry were also stressed.

American Cable Co.'s licensee in England, British Ropes, Ltd., manufactured what is said to be the longest, single piece of wire rope fabricated on the preformed principle. This rope, which is 1⅛ in. in diameter, 6x7 Lang Lay, 37,500 ft. long and weighs 35 tons, is now in use as a mine haulage rope, working in a coal mine which extends far under the sea. It is shown in the accompanying illustration.

One continuous piece of wire rope 37,500 ft. long

Trackson Co., Milwaukee, Wis., has appointed the following new distributors, who will handle Trackson tractor equipment for McCormick-Deering tractors: Highway Equipment Co., 919 First National Bldg., Columbus, Ohio, for the Columbus territory; Industrial Tractor and Equipment Co., 2702 Spring Grove Ave., Cincinnati, Ohio, for the Cincinnati territory; Fred D. Marshall Co., Columbia, S. C., for the state of South Carolina; H. O. Penn Machinery Co., 140th St. and East river, New York City, for the New York City territory, and the Raleigh Road Machinery Co., Raleigh, N. C., for all of North Carolina.

Continental Motors Corp., Detroit, Mich., at its recent board of directors' meeting elected W. R. Angell president of the company. Mr. Angell has been with the company for many years, having served as secretary, vice-president and chairman of the finance committee, and succeeds R. W. Judson, who has been made chairman of the board. Roger Sherman and James H. Ferry, both of Chicago, were elected vice-presidents. B. F. Tobin, Jr., is the new treasurer, succeeding R. M. Sloane, resigned.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Refractory Products. New catalog containing information on the use of standardized clay fire brick and super refractories. CORUNDITE REFRACTORIES, INC., Massillon, Ohio.

Nickel. Bulletin showing how quality castings are obtained by the use of "F" nickel in a correct base mixture. INTERNATIONAL NICKEL CO., INC., New York City.

Sand-Lime Brick. Folder on the advantages of sand-lime brick and showing its use in the construction of the new water works building at Saginaw, Mich., SAGINAW BRICK CO., Saginaw, Mich.

Pulverizing Mills. Circular **No. 902** is a new 4-page booklet telling in an interesting way the economic and mechanical advantages of Fuller Lehigh mills, both of the air and of the screen separation type. FULLER LEHIGH CO., Fullerton, Penn.

Locomotive Clutch. Folder covering the Whitcomb clutch for heavy duty service, with multiple disc, cork insert, fully encased and made of alternate discs of hardened and ground saw steel discs and malleable iron disc. GEO. D. WHITCOMB CO., Rochelle, Ill.

Cement Testing Machines. Folder on Riehle hydraulic compression testing machine for compression testing of concrete cylinders and blocks. Also describes other testing machines for testing concrete beams and cement or clay drain tile and sewer pipe. RIEHLE BROS. TESTING MACHINE CO., Philadelphia, Penn.

Buckets. Bulletin **No. 400A** covering buckets from ⅜ to 2 cu. yd. capacity, trench buckets and drag slips, and Bulletin **No. 500A** describing buckets from 2½ to 10 cu. yd. capacity. Both bulletins exceptionally well illustrated with full details and specifications. PAGE ENGINEERING CO., Chicago, Ill.

Crushers. Illustrated booklet on Farrel-Bacon crushers, covering complete line of crushers of various types from the 60x42-in. with large receiving openings for producing large capacities of small sized stone to the small units, such as 16x10-in. for use where ruggedness and economy of product is considered. EARLE C. BACON, INC., New York City.

Homo Nitriding Furnace. A 12-page bulletin, **No. 950**, giving a very readable description on the Homo Nitriding furnace, used for surface-hardening steel tools or production parts by the nitriding process. Bulletin gives views of installations, a diagram of the furnace, pictures of tools and engine parts after nitriding, etc. LEEDS AND NORTHRUP CO., Philadelphia, Penn.

Clamshell Buckets. Bulletin **No. 700** on "hook-on" type electric motor clamshell bucket, especially designed for service in and about the plant and used for handling sand, refuse, limestone or any other diggable bulk material. Bulletin **No. 654** on Hayward Class K digging clamshell bucket, suitable for natural excavating and hard digging work, built in capacities from 1 cu. yd. up. THE HAYWARD CO., New York City.

Sand and Gravel Equipment. Bulletin **No. P1** describing hydraulic dredge having a 15-in. AMSCO, Type H, heavy-duty sand and gravel dredge pump, direct-connected to a 500 hp. Fairbanks-Morse motor equipped with drum controller and resistor for 50% speed reduction variation and with all hull piping and fittings of AMSCO design and manganese steel. Also Bulletin **No. P2** describing hydraulic pump dredge equipment for pumping 270 tons of sand and gravel per hour in use by a large commercial sand and gravel operation. AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill.

The Healthy Worker

A SERIES of health talks by Dr. C. O. Sappington, director, industrial health division, National Safety Council, has been incorporated in a handy little book. The articles are written in simple language and outline methods of protection against disease.

Copies of the booklet are available from the National Research Council, 20 North Wacker Drive, Chicago, Ill.